THE AMERICAN GAS LIGHT JOURNAL

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[OFFICIAL NOTICE.]

ANNUAL MEETING NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

OFFICE OF SECRETARY NEW ENGLAND GAS ASSOCIATION,
BOSTON, MASS., Jan. 24, 1885.

The Annual Meeting of the Association will be held at Young's Hotel, Boston, on the 18th and 19th days of February, commencing at 11 o'clock A.M., on Wednesday, the 18th.

Members intending to propose the names of applicants for membership are requested to send them to the Secretary before the time of meeting.

The Board of Directors will meet in room 13, in Young's Hotel, on the evening of February 17th, at 8 o'clock. Papers to be read before the Association should be forwarded to the Secretary in time to be presented to the Directors at this meeting for their approval.

Friends of the Association are cordially invited to attend the Annual Meeting. Those wishing rooms engaged will please notify the Secretary on or before date of February 16th.

GEO. B. NEAL,
Secretary.

[OFFICIAL NOTICE.]

FIRST ANNUAL MEETING OF THE OHIO GAS LIGHT ASSOCIATION.

SECRETARY'S OFFICE OHIO GAS LIGHT ASSOCIATION,
TIFFIN, OHIO, Jan. 19, 1885.

The First Annual Meeting of the Ohio Gas Light Association will be held at the Burnett House, Cincinnati, Ohio, on the 18th day of February, 1885.

The Executive Committee expects that all the members will be in attendance at the meeting, and calls attention to the fact that matters of great importance, not only to the interest of Ohio but to the fraternity at large as well, will be discussed thereat.

The Association will be glad to welcome any of the brethren who may wish to pay a visit to the sessions.

JOS. BATE,
Secretary.

MR. W. H. PREECE ON THE SUBJECT OF ELECTRIC LIGHTING IN AMERICA.

It has long since been considered a truism by many that should one be desirous of obtaining the latest news he must travel some distance from home, in order that the fullest amount or measure of news may be secured. Without entering here into a dissertation as to the reasons why such an idea should have attained so great a following amongst seekers after the latest events of the day and hour, and without the slightest design or intention of either attempting to affirm or deny that generally the truism is well founded, we would like to call the attention of our readers to some statements, made in the early part of last December by Mr. W. H. Preece, F.R.S., before the Society of Arts, London, England. Mr. Preece's statements took the form of a lecture; and, by way of explanation, we will state that the lecturer is undoubtedly a most gifted electrician—in fact he is possessed of a large, varied and valuable stock of knowledge concerning the electric fluid, etc. It may also be added that he is quite a fluent talker, and furthermore has a great penchant for lecturing on his pet topic. Apart from all this it goes without saying that, having paid a visit to America, no matter how long a stay may have been made in our country, most Englishmen are seized with an irresistible desire to explain in print, when once safely home again, all about the wonders they have seen in Yankee land. The best part of this whole proceeding to us on this side of the water is the dogmatic manner in which the "authors" expound their views regarding the "customs of the country." Of course the practice, even at its worst, is harmless enough, and some of us

may possibly be pardoned for indulging in a quiet laugh at one or two of the more than ordinarily ridiculous conclusions arrived at.

To give some slight idea of how some of Mr. Preece's brother Englishmen regard him, with respect to his willingness to "lecture," it may be observed that the London *Journal*, in a short editorial note on Mr. Preece's account of his American trip and subsequent lecture, declared, "Of him it may be said that he must lecture or die. Fortunately, if his lecturing does him good, it does not hurt anybody else." With this understanding as to the precise nature and degree of acuteness attendant upon Mr. Preece's peculiar mania, we may proceed to discuss one or two points in connection with "diseased's" presentation of the subject of electric lighting in America before the Society of Arts.

He starts out with the grandeose information that "electric lighting is flourishing in America much more than it is home," in support of the proposition adding that "there are 90,000 arc lamps alight every night in the States." How the gentleman managed to find out the precise number is still enveloped in mystery, and we fear it will remain so. He contrasts the "brilliantly illuminated avenues of New York city with the dull and dark streets of London," and then conveys the astonishing (to a New Yorker) information that he "drove from the Windsor Hotel to the Cunard wharf through streets entirely lighted by electricity." Perhaps he did; but the illumination must have been devised for his especial benefit and pleasure. It might also be remembered that whatever elegancies of electric illumination were perceived by Mr. Preece were only to be obtained by the taxpayers at an expenditure of $255.50 per annum for each "arc." One "arc" supplants 52 gas lamps, costing at the rate of but $17.50 each per annum; and it would seem as though, all things considered, a rather neat price was being paid for lighting the "brilliantly illuminated avenues of New York."

It is not our intention to go through the entire chapter of marvelous American electric lighting progress accounts so catchingly strung together by the enthusiastic English electrician; still, we might mention the case of that Brush-Swan experiment at Washington, D. C. Regarding this case, Mr. Preece said: "Washington has been experimentally illuminated by the Brush-Swan Electric Light Company, by very large arc lamps of 4,000 candle power each, fitted with large conical reflectors, throwing a great body of light down the streets to be illuminated. The various avenues radiating from the Capitol are thus lighted; and a circle of 14 lights, without reflectors, surrounds the top of the Capitol, the effect of which was reported to be very fine." Mr. Preece must have gotten this information from pure and simple sources—more than likely in some way connected with the particular Brush-Swan operators of the Washington experiment. The plain truth as to the Washington scheme is that a more ridiculously absurd piece of public lighting was never before foisted upon the people of any city in the world; and one cannot withstand adding, "its like will never be seen again," concluding with the hope that thereto we may cheerfully say "Amen."

As before intimated it is not our purpose to point out all the "glowing" examples instanced by the lecturer in support of his proposition that America was distancing the older countries in its public appreciation and application of electric lighting methods. It is quite sufficient to let the stories told by the lecturer on the subject experience the weight of the lapse of time. The solidity of that application will be quite sufficient to crush them out of shape, and so let their contained "wind" mingle with the outer atmosphere. What we desire to call particular attention to is this.

It is urged by Messrs. Preece and his associates, so deeply interested in the growth of electric lighting in England, that American electrical promoters are unhampered in one important respect—in so far that high-tension currents may be carried along aerial wires. They are not slow in asserting that perfect insulation is so easily attainable that the danger involved is really *nil*, and that the restricting of conductors beneath the roadways practically debars the electrical promoter from carrying on his business at a profit. The English legislator is slow to act; but at the same time he is also pretty sure, and is therefore not often given to the necessity of undoing that which he has once determined upon. His American brother unfortunately acts in the reverse way, and as a consequence he too often is obliged to devote much of his time in altering and amending the rules and regulations first formulated.

Beyond all doubt and cavil the aerial system of stringing electric light wires (considered without any reference to unsightliness) is disgraceful, hazardous, and positively perilous. The city of New York on two occasions during the present winter season has had ample illustration of the dangers attendant upon the practice. The first of these occurrences was reported in issue of JOURNAL for Dec. 16th, 1884 (p. 322), and on the afternoon of Saturday, Jan. 17th, a precisely similar case as the one previously explained was put upon record. Friday, Jan. 16th, was signalized by one of our usual midwinter storms. The thermometer was abnormally high, and a veering of the wind course to the southeast brought on a regular hurricane during the night, which lasted until well on in the afternoon of Saturday. The "perfect" insulation of the wires was tested by repeated writhings and contortions of a long section which was separated from its fastenings; and the usual result followed. The naked portion of electric light wire made contact with the fire department circuits, and for upwards of an hour fire headquarters was absolutely left without means of communicating a signal to the engine houses of department. New York cannot afford to have its property so imperilled simply because electric lighting schemes may be made to return a profit on the money invested in them. Therefore do we contend that it is better to follow the plan of those who work slowly, even though some special enthusiasts be actually disgruntled to the point of claiming that the march of applied science is thereby throttled.

ANOTHER VICTORY FOR THE SIEMENS BURNER.

The above heading is hardly fair to that energetic gentleman Mr. Stein, who is the presiding and persistent official head of the Siemens Regenerative Gas Lamp Company, of Philadelphia, Pa., and whose alertness in the matter of seizing available opportunities for making plain to everybody what can be done in the way of lighting large areas with gas as the illuminating agent has ever been conspicuous. His successful competition with the electric lighting promoters of Philadelphia, Pa., whereby he wrested from them a goodly portion of the work of brightening the public squares at night, was recounted in the December 16th issue of JOURNAL, and so is still fresh in the minds of the fraternity. Of course the victor had good reason to feel elated over the victory; and it must be said of the gentleman that one effect success upon him is to spur him on to "seek pastures green and fields anew,' wherein he may still revel in the fruits of new conquest. A celebrated owner of American thoroughbred racing stock is said to instruct his jockeys to "go on in front," and never trust to "a waiting finish," for fear that possibly the "finish" might be "drawn too fine;" and as a reason for such instructions he advances the plea that if his horse *is* "to show the white feather, the animal might as well wave it when in front as when in the middle or the rear of the pack." Friend Stein evidently believes in that theory, for he *does* set out after business as soon as the flag drops; and just put a pin here—when Stein "goes out in front" he stays there. Here is his latest "burst of speed."

All good Cleveland men are supposed to have in contemplation a visit to that inauguration ball that is to take place at Washington, D. C., on the evening of March 4th. The Blaine men cannot really object to this, seeing that about 28 years have intervened since "Buchanan's Ball." The Pension Building having been selected as the place for the dancing festivities, Stein knew very well that the place had to be lit up, and so he put in his "little bid." The electric promoters were hot on the scent, and made a great effort; but our irrepressible heavyweight, following in the wake of all celebrated men, made the "greatest effort of his life," and "carried the day"—or rather the night. On the occasion of the festivities mentioned the Pension Building will be entirely lighted with gas, the contract made calling for the furnishing of 86 five hundred-candle power Siemens burners. The ball-room proper (320 feet long by 125 feet wide) will be assigned 40 lamps; each of the 30 supper rooms (40′ by 40′) to contain one lamp; the remaining 16 to be appropriately arranged in corridors and at main entrance. This is undoubtedly the most important and largest exponent of public lighting of this sort ever before attempted in the United States, and it is certain to prove successful. What will be Stein's next move? And while we are upon the subject we cannot help thinking that Mr. Geo. A. McIlhenny and the Washington Gas Light Company had much to do with the final issue.

A CONFLICT OF DATES.

From the "Official Notices" appearing in this issue it will be perceived that the dates selected for the annual meetings of the New England and Ohio Gas Light Associations are in unison in so far as the day of month is concerned, thus of necessity giving rise to an unfortunate state of affairs. The fault of conflict cannot be laid to the officers of the older body, as the New England Association has for years held its annual session during the middle or latter portion of February, and consequently had the right of selection. The Ohio Association's action is all the more regrettable after one has read the official circulars, forwarded by Secretary Bate, since perusal of them shows that, if the printed programme is duly carried out (and it is certain it will be), a most fruitful meeting will result. The conflict of dates will keep many an Eastern visitor from attendance at Cincinnati on February 18th. It may be trusted that the Ohio body will take measures to obviate this conflict as to 1886; and we confidently assert that the 1885 sessions of both assemblies will be of benefit to the fraternity at large.

PROMOTED.—At the recent annual election of Directors of the San Francisco (Cal.) Gas Light Company Mr. J. B. Crockett, Jr., was chosen President. Mr. Crockett has for some time past been the efficient Engineer of the San Francisco corporation.

[A Paper read before the Society of Gas Lighting.]

The Proper Ratio of Storage of Gas to Consumption.

By Col. F. S. Benson.

It was not without experiencing a feeling somewhat akin to embarassment, that I found myself selected to prepare and read the first paper before you in this new year of our deliberations; and I must confess to a strong impression that my effort may not raise the standard—either of exhaustive calculation or theoretical and chemical research—sufficiently high to afford an example to my associates in the profession; thus losing the somewhat pleasing idea that I might possibly take unto myself the credit of having stimulated them to renewed effort in the preparation of elaborate and finished essays on some of the more obscure points in our common business. But I trust, however, if, failing to accomplish that (and thereby earning the criticism of a few), I shall earn the gratitude of the many, to whom, if I may so express it, the task of writing a paper for this Society on some abstruse question, and afterward submitting the same to the sharp criticism and rapid mental calculation of all, looks like an almost insurmountable, and possibly even a thankless, task.

Interesting incidents and wonderful experiences sufficient to arrest your attention, and important enough to form in themselves at once a novel and exceptional topic, or whose recital would go to make a thoroughly "taking" subject for a paper, do not occur every day, or even every year, to any one of us; and we are therefore obliged perforce to recur to the well-worn theme and oft-told story, so often encountered and so frequently recited on the road that leads from the retort house to the consumer's meter.

Now, to leave the realms of self-abnegation and deprecatory explanation, it undoubtedly has often occurred to us that perhaps our papers, even if lacking many prominent features possessed by finished compositions, or the conspicuous exactness of standard text books outlining and explaining the mysteries of gas manufacture, might accomplish the object of producing a general and animated discussion on some vital and practical point. If this end were achieved, it would seem as though nothing more need be desired. It is with this object in view that I call your attention to the subject of "The Proper Ratio of Storage of Gas to Consumption;" or, in other words, when shall the holder capacity be increased? Of course, it is assumed at the outset that this question is to be considered only in reference to the maintenance of a properly proportioned and well balanced plant; and furthermore a plant situated in a district possessing a healthy annual growth in the matter of output. It seems to me that this is a question sure to arise in the experience of every gas engineer, and one whose claim to pressing attention and careful solution must needs be carefully considered.

I hardly may note that authorities differ in regard to this matter. Clegg states that, given a daily consumption of 305,000 cu. ft., storage capacity for 125,000 cu. ft. is sufficient; Frederick Colyer, in his volume on "Gas Works, their Construction, etc.," insists that the minimum storage capacity should be equal to two-thirds of the largest make of gas per 24 hours; in small works he asserts the storage should be equal to the largest production of any one day in the year—the last proposition, to my mind, being much nearer to the mark than the former. Indeed, I might here state what has become a common answer to this question among our American engineers; their prevailing reply being that a holder capacity of 75 per cent. of largest consumption in 24 hours is proper and sufficient.

The duty of stating the necessity, as also making requisition, for an increase in holder capacity naturally enough falls to the engineer; and with this duty is inseparably connected that of *explaining* the necessity, by the advancement of proper and cogent reasons for such request. How much better, then, is it in such situations to have your arguments backed up by those adopted beforehand through the combined wisdom and practical experience contained in a Society like this, rather than to depend entirely or partly on the text books—for these, even at their best, can produce but a theoretical suggestion.

That it is a question of *economy* alone in manufacture is to be very gravely doubted; safety also is involved, since circumstances might arise necessitating a stoppage of the plant for the making of unexpected repairs at a moment when, with small holder capacity and large consumption, this cessation of manufacture would endanger the supply; and, warned by history, we all know these vexatious accidents have a most unpleasant faculty for happening at the most inopportune seasons. Different locations, too, in regard to the class of consumers supplied, etc., have much to do with this question of holder room; and perhaps a rule that would apply to and govern a majority of cases might be utterly useless in its application to a small minority.

Take, for instance, a large manufacturing town, containing many woolen or cotton mills kept in operation until 8 or 9 o'clock P.M. for six nights in the week. Under such working necessity the gas engineer is placed at the disadvantage of being obliged to send out a large quantity of gas during a period lasting but a few hours; and when the mills close down for the night the demand for gas becomes almost *nil*. It seems to be unnecessary to note that in such a case, both for safety and economy, a greatly increased storage capacity would be required over that found sufficiently ample in situations where the consumption is more equably divided over the entire evening.

In looking the matter over, then, as carefully and as intelligently as possible, I have come to the conclusion that the safe and economical ratio of proportion is to have a storage capacity equal to the average consumption of heaviest month's send-out in the year—which month, in this part of the country at least, may undoubtedly be set down as December; and I may here add the corollary, when such consumption exceeds the holder capacity it is high time for the engineer to agitate the matter of a new holder, with the understanding that part of the "agitation" will be directed toward setting the time by which the holder is to be completed at a period sufficiently early for the following fall and winter's business.

With such a rule carried out we should not be in doubt about "giving up" a bench when the consumption begins to decrease; whether or not it would be best to "let it down" permanently, instead of "holding on to its use for a few days," all on account of fear that "dark weather" might occur, and thus "run short" of gas. On the other hand, to chase away all such conflict of doubt and fear, should the engineer decide not to take the "chance of letting down the bench," why, he accepts the other alternative of "missing" from 6 to 30 retorts each 24 hours, through lack of storage room; thus woefully adding to the percentage of "unused retorts"—so damaging to the figures expressing "average production of gas per man," and "gas per bench under fire;" both important factors in the cost per thousand cubic feet.

Such a ratio of holder capacity would also, in most cases, admit that minor or major repairs be made at any hour of day or night, even if the repairs necessitated the stoppage of the works for a short time, without vitally endangering the supply.

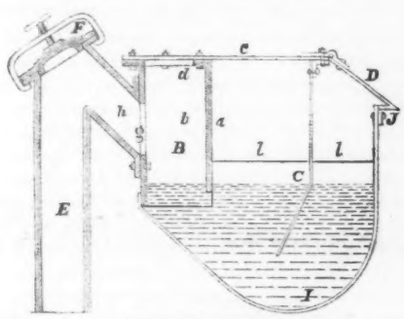
The gas engineer is often confronted by one or more of his directors with the query, "Can you not get along with your present holders?" even when the storage room is far below the proper one; and to the query he is obliged to answer, "Yes, we *can* get along;" and he would have to respond similarly had he but 50 per cent. of holder room as compared with his consumption, because it *could* be done—but only at an expense of both safety and economy.

Is it not better, then, to establish a hard and fast rule—one to which we can agree unanimously—as to where the proper proportion lies; and, further, when once agreed upon, to assume any deviation from it to be an evidence of poor economy and poor engineering?

The Boardman Hydraulic Main.

The improvement in hydraulic main construction herewith presented to the notice of the readers of the Journal is a result of the practical studies and continued experiments of Mr. A. E. Boardman, of Macon, Ga. The inventor, in common with his brother engineers, has experienced considerable difficulty in the matter of handling the accumulation of heavy tars which so often bother the gas manager working under the high and steady heats obtained by the use of the modern regenerative furnaces; and his device is designed and applied with the idea of affording an easy means for facilitating the removal of these heavy tars, to the end that the frequency of stopped stand pipes may be diminished.

The illustration represents a transverse section of the hydraulic main through center of one of stand pipes. The stand pipe, *E*, enters the side of



Transverse Section.

dip pipe, *B*, through the inclined bridge pipe or branch, *h*, and opening, *g*. This stand pipe is furnished with a removable cap or lid, *F*, to allow ready access to stand, bridge, and dip pipes for their easy cleansing. The dip pipes, *B*, instead of being independent vertical ones, as usually constructed, are preferably built in the shape of a rectangular box divided by vertical partitions into separate compartments, one for each retort in the setting. The lower ends of these compartments are, of course, open, being sealed by the ordinary water seal, while the tops are covered by the top plate of the

main, *c*, and bolted to it by the flanges, *d*. The partitions separating the dip boxes extend two or three inches below the rear wall, in order to prevent the gas from passing from one to another—an occurrence which, under certain conditions, might otherwise ensue. The lower edge of the rear wall, *a*, beneath which the gas passes to the body of the main, should be serrated, so as to reduce to as slight degree as possible the oscillation of the gas in the retorts.

The bottom of main, *I*, is inclined down and away from the dip boxes, so that the tar as formed will drain rapidly to the lowest point near the back of the main. The rear of main extends some distance up above the water line to the point, *J*. The apron, *C*, extends the entire length of main and to a certain depth in the water, so that, by no possible chance, can the gas issuing from the boxes, *B*, escape into the cleansing compartment.

The cleansing compartment is located between the apron, *C*, and rear of main, *J*, and is closed by means of the movable top or cover, *D*. This cover may be opened at any time, and whatever tar may have been accumulated can be removed through the opening or pulled along toward the tar pipes at ends of main, the choice of displacement method depending entirely on the will of the operator.

Division plates, *t*, may be inserted, extending a trifle above the normal water line, with the effect of dividing the entire main length into as many sections as are deemed desirable, to the end that the lowering of water line during the operation of cleansing any one section will not unseal the dip boxes in another. If the divisional plan be followed each section, of course, would require to be provided with tar and overflow pipes.

The ease with which every part of a main on the Boardman plan can be reached and cleaned, without in the least interfering with the make of gas; the single change in the direction of gas flow during its progress from the retort to the main; the solitary cap to be removed in order to clear the stand, bridge, and dip pipes of obstructive accumulations; and the one and only place where leakage has to be guarded against, are points of excellence which are well qualified to attract the attention and commend themselves to the notice of every gas engineer.

Those who have experienced the aggravating annoyances connected with the deposits of heavy tar in their hydraulic mains (where is the manager who can say he has not at some period battled with the nuisance?), along with the consequent more frequent stoppages in stand pipes; and also those contemplating the adoption of regenerator furnace systems, with the view of obtaining a productive duty of from eight to ten thousand cubic feet per retort in 24 hours, would do well to examine into the merits of this improvement in hydraulic main construction. We might add that Mr. Boardman has had the plan in use at his Macon (Ga.) works for some time back, and the arrangement has fulfilled his expectations in every particular.

Gas Heat for Mechanical Purposes.

By T. J. C.

Gas-Heated Bakers' Ovens.—In continuation and conclusion of the subject treated of in the last issue of the JOURNAL, the first portion being devoted to a description of the Thompson Brothers method of firing gas kilns, it is herewith proposed to make some mention of the Thompson plan of heating bakers' ovens by gas. It is undoubtedly admitted now that the gas-heated kiln is a perfect success; and this verdict has perforce been rendered because of the satisfactory and long continued practical working results obtained by those who have adopted the system. This in itself constitutes a great stride in advance toward bringing the gas maker directly within the pale of a manufacturing territory hitherto exclusively occupied by the seller of solid fuel, and that such a step has been achieved affords neither a mean nor narrow reason why congratulation should be indulged in on the part of the gas engineer. But while this advance has been registered, it must still be borne in mind that the manufacture of artistic glass goods is rather restricted, in so far as certain localities must of necessity be chosen as centers of such production, and that one of these centers is still further able to supply a wide extent of territory blessed with a numerous population. Remembering this, then, only the gas maker of the favored center of glass manufacture will be especially benefited by increased send out, and it is on that score one is disposed to assert that the successful introduction of the gas-heated baker's oven would be more generally beneficial to the gas industry of America, since every city, town, and even hamlet in the country may safely be counted on to contain some sort of a baker's establishment. Indeed, remembering the multiplicity of bakers' ovens, it would not appear at all unreasonable to assume that the future consumption of gas will be greatly augmented by the aid of gaseous firing as applied to the trade of the baker.

Almost every one is at least in some degree familiar with the present practice of heating the baker's oven, and can appreciate the filthiness and uncouthness of that practice. Coal-heated ovens are cumbersome, costly and dirty; and the ovens heated by wood fuel are absolutely filthy. The oven mouthpiece is opened, chips or shavings or billets of wood are thrown upon the tiles, the collection is set fire to, and the process of heating begins. When the required temperature is supposed to be attained the rakes are resorted to, and the tiles must be "swabbed out" with a mop. In short, the wood fuel plan may be classed with many another practice as belonging to the barbaric age. Smoke and soot, dust and ashes, all in abundance; irregularity of heat, uncertainty of working—it is a wonder that it has survived so long. The anthracite-heated oven, while far from cleanly, is a most expensive method; and in fact it is a very easy matter to determine the situation of such an oven by inspecting the flagstones in front of a bake shop during the progress of a gentle fall of snow with the thermometer, say, at 32°. The observer may note that the falling flakes melt almost as soon as they make contact with the footway of the sidewalk. It will hardly be considered an economical action on the part of the manufacturer of the "staff of life" to keep the pedestrians' way clear of snow through the agency of his oven; but this, in effect, is one thing that he does accomplish.

One of the chief advantages claimed for the Thompson plan of gas heating for bakers' ovens is that the heat is saved, or rather it is directed to the oven proper, and not wasted or spent in raising the temperature of an immense mass of masonry. It is not the intention of the writer at the present time to give any extended description of the Thompson oven, the purpose being to attract the notice of the fraternity to the fact that a principle has been devised whereby the problem of such application of gas firing has been at once successfully and economically made, and which has already been extensively carried out in England. However, to give some idea, imperfect though it may be, of the Thompson plan, it might be said in general terms that the principle is quite similar to the one involved in the Thompson gas-fired kiln. The inventors recommend that for continuous baking, such, for instance, as the case of a combined confectionery and bread baking establishment, the externally heated oven be employed. Suppose you were looking at the exterior front wall and mouthpiece of a baker's oven; at the base of wall and near to each end are situated suitable compartments or boxes communicating directly with oven interior, sunk to a slight depth below floor tiling of oven. In these compartments are placed the burners (the supply pipes to which are brought down over front wall) intended to supply the heat. When the heated air current begins to move it ascends close against interior front wall of oven, reaches the arched roof, rolls along its top, strikes back wall, and descends again to oven floor tiles. Here it enters a space communicating with or leading to a series of flues running lengthwise underneath oven tiles—the number of these flues is determined by size of oven—when the current forces its way back to point of starting, and thence out through flue connection to chimney.

For intermittent baking, or in such instances as where but one or two batches of bread are to be provided for, it is recommended to employ the internal plan of heating, which is similar in principle to the other, differing therefrom only in the disposition of the lengthwise flues. The system is really an adaptation of the regenerative principle of firing.

None of these ovens have as yet been put up in the United States, but a contract has been made with a "Vienna" Baking Company, of this city, for the erection of an oven 12′ × 10′ inside measurement. When this shall have been placed in successful operation more will be said about it.

As before intimated, a number of them have been working for some time in England, and to show some figures relative to their economy it may be here mentioned that not long ago (early last December) the writer was shown a letter received from the proprietor of a large baking establishment located at Leeds, England, in which it was stated that on a then recent occasion the oven (9′ × 8′ inside) had been in steady working from 8 A.M. until 6 P.M.; the bakers had "come on" at 6 A.M., gas was turned on with their arrival, and shut off at the end of two hours, when cooking was commenced and proceeded with until 1 P.M.; then, requiring more heat than usual, on account of extra work, gas was again turned on until 2:15 A.M. The gas was "on" for a total of 3¼ hours; and the total consumption required to keep the oven at working heat during the period of 10 hours was 585 feet; and it should be here added that the oven was, even at the end of that time, quite ready for further effective duty.

[OFFICIAL CIRCULARS.]

First Annual Meeting of the Ohio Gas Light Association.

[We cheerfully accord space to the following "official circulars" containing important information for the Ohio fraternity, and the fraternity at large as well, concerning the first annual meeting of the Ohio Gas Light Association. The circulars explain themselves.]

CIRCULAR NO. I.

OFFICE OF SECRETARY OHIO GAS LIGHT ASSOCIATION,
TIFFIN, OHIO, Jan. 19, 1885.

To Mr. ———, of —— Gas Company,

DEAR SIR:—During the past summer a number of gentlemen connected with the gas interest of our State met in consultation, having for their object

the organization of a State Association of Gas Superintendents and Managing Directors. It was decided to send out such number of circular letters as would be sufficient to show by the reply of parties thus addressed whether a State Association was considered desirable by the practical men engaged in the gas business.

These letters having been received for the most part with favor, a call was then made by circular for a meeting to be held at Columbus, Sept. 17th. This met with a hearty response, and forty names were placed on the roll. An organization was at once effected, officers chosen, and, after a most profitable session, the meeting adjourned. The regular Annual Assembly of the Association will be held at Cincinnati, on the third Wednesday of February, 1885.

The attention of superintendents is especially called to the fact that during the discussions at Columbus the *scientific* subjects were neglected, but a most animated and profitable handling of the more practical details was had. And in this connection we wish to suggest that as each superintendent or managing director is constantly meeting with something new or troublesome in the daily management of his works, and as all such matters are of interest to the whole fraternity, it is desirable that all interesting details or incidents be written up with such remarks or inquiries as the writer may wish to make, and the communication forwarded to the Secretary of the Association. He will arrange such papers, and submit them to the Executive Committee for inspection.

It is believed that if every one who has any question to ask, or information to impart, on any subject connected with the daily workings of a gas works, will thus place the matter in shape for discussion, the Association at its next meeting will not lack in interest.

No gas superintendent—no matter how small his works—but has a varied experience. If he has nothing to give he certainly will find something which will be of benefit to receive, and all is freely given.

Your attention is earnestly called to this matter, and it is hoped you will at once send in your application for membership. The entrance fee is $3.00. Annual dues $2.00.

Let us have a representative from each of the eighty gas companies of Ohio at our February meeting.

This Association is not expected to interfere with the interests of the Western Association, but to bring together in closer fellowship the working brethren of our State, and for the general good.

OHIO GAS LIGHT ASSOCIATION,
JOS. BATE, SEC'Y.

CIRCULAR NO. II.—*Notification from Executive Committee.*

OFFICE OF SECRETARY OHIO GAS LIGHT ASSOCIATION,
TIFFIN, OHIO, Jan. 19, 1885.

To Members of the Association, and all Practical Gas Managers in the State:

The Executive Committee of the Association wish to call your attention to the fact that the First Annual Meeting will be held at the Burnett House, in Cincinnati, Ohio, at 9:30 A.M., on the 18th day of February, 1885.

They have selected the following subjects for discussion, and expect to have short papers prepared on each by the members to whom the several subjects shall be assigned. It is earnestly desired that *all* the members will endeavor to be prepared to discuss all matters thoroughly and intelligently, so that our First Annual Meeting may be most profitable.

Subjects:

1—The prevention of napthaline as a deposit in gas works plant.

2—How to prevent tar passing into purifiers.

3—The use of gas stoves as a means of increasing the consumption of gas.

4—Natural gas; what is it, and can it become a competitor of coal gas as an illuminating agent?

5—Does it pay to use any lime in connection with oxide of iron?

6—How much coke is lost as screenings after being crushed, and what advance should be added to price of coarse coke to make crushed coke equally profitable to sell by gas companies?

7—What plan or system is the best for finding leaks in lines of gas mains, and what is the best joint for gas mains?

8—What percentage of the loss of gas is due to leakage, and what to condensation?

9—What is it that obstructs the service pipes to lamp posts and to consumers in extreme cold weather, and is there any way to prevent this annoyance?

10—How can the form of the retort or the manner of setting the same be improved?

11—Gas vs. coke for heating retorts.

12—Regenerative furnaces.

13—Do we gain any heat or save any fuel by passing steam through our grate bars?

14—What is the loss in weight of coal from a storage of six months, or the difference between weights of coal when put into coal house and weights charged into retorts?

As all the above subjects are of great practical importance to all gas managers, it is hoped there will be a free discussion of all.

A. HICKENLOOPER,
JAMES RAYNOLDS,
P. W. HUNTINGTON,
A. S. BUSHNELL,
H. J. REINMUND,
} Exec. Com.

JOS. BATE, Sec'y.

[From Journal of the Society of Arts.]

On the Use of Coal Gas.

By HAROLD DIXON, M.A.

[In accordance with statement made in issue of JOURNAL for Jan. 16, we reprint below the second lecture on this subject delivered by the author before the Society of Arts, London, England. The date of its presentation to the Society was Monday, Dec. 8, 1884.]

LECTURE II.—COAL GAS AS A SOURCE OF LIGHT.

When last I had the privilege of addressing you I mentioned that the diffusion of lighter gas into denser air through a porous diaphragm might be made use of for determining whether there was an escape of gas in a room; that the lighter gas, passing more quickly through a porous diaphragm than the heavier air got out, would increase the pressure inside the vessel, push down a column of mercury, make metallic contact with a battery, and ring a bell. Since last week I have received one or two letters on this subject, and, thinking it might be of interest, I have put up a rough apparatus to illustrate how such an instrument as I have described might be made. Instead of having a straight arm, in which a colored liquid, such as a solution of indigo, is moved, I have connected with the porous vessel a bent U-tube, with mercury in the bend. There is a platinum wire sealed through the glass tube, which I can connect with the wire from a battery; a wire also passes down the open end of the tube, and may be placed at any distance from the top of the column of mercury. If I connect up, and let a little coal gas escape close to the porous pot, the gas immediately diffuses through the pot more quickly than the air can get out; the pressure is increased inside, the mercury is pushed down in the arm connected with the vessel, is pushed up in the other arm, and metallic contact is made between the mercury and the platinum wire. Immediately the battery circuit is completed, a bell at the other end of the room announces the escape of coal gas from this pipe.

I pass on now to the subject proper of my lecture this evening—the use of coal gas as an illuminating agent. We saw last time that, of the components of coal gas, only a small part, by volume, contributes to the light; that the carbonic oxide, hydrogen, and marsh gas, which made up some 95 to 97 per cent. of the whole, contribute barely anything to the light given by the gas flame; that the other constituents, the ethylene or olefiant gas, and the other gases of the same type as ethylene (the olefines), and the benzene and the naphthalene, are the gases whose burning gives light in the flame. Now, the light is due to what may be not inaptly called a selective combustion. When coal gas is burnt in air, and care is taken that the gas does not mix too quickly with the air, but comes into it gradually, the hydrogen of the hydrocarbons burns before the carbon. Let us take ethylene as representing the luminiferous constituents of coal gas; each molecule of ethylene is composed of two atoms of carbon and four of hydrogen, and chemists write it C_2H_4. This ethylene, when it is raised to a high temperature in contact with air, is decomposed, the hydrogen burning first and the carbon afterward. There is a race for the oxygen of the air between the two constituents of the ethylene, and the hydrogen, being the fleeter of the two, gets to the oxygen first and is burnt to water. So for a short time the carbon of the ethylene is unburnt, and is separated from the hydrogen. It aggregates into little solid particles, which are raised to incandescence by the burning gases around. The carbon then, in its turn, reaches the air outside of the flame, and burns to carbonic acid. If we wish, then, to get light from coal gas, we must burn it in such a manner that the hydrogen burns first and the carbon afterward.

Before I go on to show the particular burners which have been devised by many skilful hands to gain this object—the selective combustion of the hydrogen before the carbon—I will burn a sample of coal gas which has been deprived of the luminiferous hydrocarbons by treating it with Nordhausen acid; and to compare with that I will take some ordinary coal gas, and burn it in a similar vessel. In these two vessels, then, I have a sample of coal gas which has been treated with Nordhausen acid (and so deprived of the luminiferous hydrocarbons), and a sample of ordinary coal gas. When I burn them, you see the difference in illuminating power is very well marked. In one case you have a flame with more or less light in it, due to the separation of carbon; in the other you get no light at all. In the latter case the coal gas has been deprived of the three or four per cent. of ethylene and luminiferous hydrocarbons by the Nordhausen acid.

I will try another experiment with ethylene, to show you an example of selective combustion. With this ethylene I will fill this glass cylinder one-third full. I will now take another gas—chlorine—and fill up the cylinder with it, so that in this way I get a mixture of two volumes of chlorine and one of ethylene. Now I apply a light. I ask you to look at this deposit of carbon. The mixture of ethylene and chlorine is perfectly transparent; but as the flame ran down the cylinder the chlorine effected a selective combustion. It took the hydrogen only and left the carbon. The carbon is left in this finely divided state, and the whole of this cylinder is now filled with this fine smoke—little solid particles of carbon—because the carbon has not the same affinity for chlorine that hydrogen has.

A selective combustion, similar to this but not selective in so marked a degree, is shown when coal gas is burnt in air. The hydrogen has a stronger affinity for, and is quicker in burning with, the oxygen of the air than the carbon is. The latter gets left behind, just as it was left behind in burning with chlorine, only there is this difference—that in the case of the chlorine the carbon was not burnt at all, but was all left behind; whereas in the case of ethylene burning in air, or coal gas burning in air, the carbon is finally all burnt.

Through a bye-pass in this lamp I am now passing some ordinary coal gas. It burns with a luminous flame, giving a light, perhaps, of some seven or eight candles—certainly not more. You notice that if I turn on the gas too full we get this roaring of the gas flame, of which I shall have to speak more fully directly; but I now turn it down, so that it no longer roars or flares. The flow of gas can be turned through the body of the lamp, where it passes over some condensable hydrocarbons, and then you see the gas mixed with these hydrocarbons gives us a very much whiter flame than ordinary coal gas. This lamp illustrates the effect which these hydrocarbons have on the illuminating power. Now, since it is entirely due to the small quantity of ethylene and other hydrocarbons that we get light from coal gas, their proportion is, of course, a matter of great importance. Anything in the process of gas manufacture which will add to the volume of ethylene any other hydrocarbons will increase the value of the gas; and the best way for determining the value of a sample of coal gas is to determine the volume of olefines which it contains.

This lamp will also illustrate another point, and that is the effect of pressure on the burning of coal gas. You see if I turn the tap on full, there is now such pressure at the burner that we get this roaring flame, and very little light from it; not nearly so much light, you will notice, although the flame is longer, that there is when I turn the gas down and burn less. We get a better light with a steady flame than we do when it is roaring. Now I will turn the tap down and regulate the gas supply until it burns with a quiet flame; then, by quickly turning this tap round, I can make the gas pass over the hydrocarbons. The gas will then become mixed with some of the hydrocarbon vapor, and you will see that, although it is burning under the same pressure, it will no longer burn with a quiet flame. Turning off the gas from the hydrocarbons, there is a quiet flame with the same pressure of gas. It is evident, then, that coal gas must be burnt with a due regard to pressure; a rich gas must be burnt with less pressure than a poor gas to get a steady light.

Now, pressure chiefly acts in this way: With a high pressure the gas is forced out quickly from the small orifice of the burner, and so mixes with the atmosphere before it burns. But there is also another thing. When gas issues quickly from an orifice, it forms what we may call whirlpools of gas, and burns irregularly on this account. I do not know, and I do not think anyone has yet explained, why coal gas which has passed round a corner suddenly, like the corner of a gas tap near to the burner, should burn with an unsteady flame some six or eight inches off; but such is the fact. The coal gas in passing round the corner suddenly seems to be thrown into eddies, and it is a long time before it steadies down to a regular flow. Why it should be so long I am quite in ignorance, but there is the fact; so that, if you have a tap close to the burner, and the pressure is too high, and you try to reduce the pressure by turning down the tap, you will very often get such an eddy produced, and a flickering flame is the consequence; so I recommend, in all gas burners in a room, that the tap should be placed some two or three feet off the burner. In that case, in spite of the gas running past the sharp edge of the tap, it has time to steady itself down into its normal flow, and burn with a steady flame.

I have here an ordinary gas burner—a fishtail—and I have connected it with a bag containing coal gas. By suitable pressure on the bag, we can drive out the gas at any rate we please. I am increasing the pressure now, but however much one increases the pressure, even to making the gas roar, one does not increase the light one gets from it. The gas is forced out into the air and mixes with it; the rush of gas produces a partial vacuum in the immediate neighborhood of the orifice, the air is drawn in and mixes with the gas, and the two burn together with this blue, almost non-luminous flame. Here is another burner, connected to the same supply pipe. In the one case we have the gas pouring straight out into the atmosphere, unchecked in its flow; in the second case we have a governor placed between the gas pipe and the orifice where the gas issues into the air. This governor checks the flow of the coal gas, and only allows a certain quantity to pass. The effect is that the flow is regulated and maintained at that rate which is found to give the best light for the particular sample of coal gas used. While one flame roars and gives but little light, the other continues to burn steadily and well. Now, unfortunately, in all gas supplies on a large scale one cannot get rid of inequalities of pressure. Some houses are on higher ground than others, and of course, owing to the lightness of coal gas, they have an excess of pressure. Again, when large quantities of coal gas are being consumed, as in the evening hours, the pressure has to be turned on in the gas works, and sometimes—until the consumption reaches its maximum—there is an excess of pressure in the mains. Now, with a governor such as I have shown you here this roaring and wasting of the gas is completely got rid of. I will not go so far as to say that every burner in a house must necessarily have a governor, but I think a governor should be placed on each floor, which will regulate the flow of gas to all the burners on that floor. But the burners with which one is more particularly concerned—those in our sitting rooms and dining rooms—should each have their separate governor. By this means one gets a steadier flame, and one burns the gas to greater advantage.

We may say, then, that the first requisite for obtaining a good artificial light from coal gas is that the flow of gas into the air should be regular and as slow as possible. Several contrivances have been elaborated to produce this result. Some are complicated, and some apparently quite simple; and I may say that the simple ones seem to me to work nearly as well as the more complicated. Here are two different kinds. In the one there is a large chamber introduced into the burner below the orifice; into this chamber the gas passes through a small hole. The hole being smaller than the orifice through which the gas finally escapes, the gas rushes through the small hole into the chamber, and then passes slowly out through the orifice. The other plan is to have a movable diaphragm just below the burner, which is pushed up by the pressure of the gas. Whenever the pressure of the gas below this diaphranm is greater than the pressure above, by the weight of the diaphragm it moves up and partially closes the orifice through which the gas escapes. Such is the form of governor used in Mr. Sugg's burners. A piece of steatite is pushed up by the gas, and partially blocks the hole from which the gas escapes into a chamber below the burner; so that, if the gas is running in under a greater pressure, the diaphragm is pushed higher up than when the gas is running in under a smaller pressure; consequently, with the greater pressure the hole through which the gas can escape to the orifice is smaller than in the other case; so that the same quantity passes to the burner, whatever pressure is used. I have not time to describe all the various forms of governors that have been devised for limiting the flow of gas; I merely describe these two types, for all others depend, I think, upon the same principles—either the filling of a large chamber through a small hole, or else the movement of some diaphragm which checks the passage through which the gas is flowing, like the throttle-valve of a steam engine.

Now, the second requisite for obtaining a good light from coal gas is that the supply of air should be steady, regular, and slow to the gas flame. We have seen that it is necessary to have the supply of gas steady and slow, and we find the same thing is true of the supply of air.

Now, with a flat-flame burner in the air without a chimney, it is not easy to get the supply of air regular. One of the devices which have been adopted with very considerable success, I think, is to make a little projecting ridge all along the top of the burner. Mr. Sugg calls this the table-top burner. This ridge prevents the air which is rising to feed the flame from impinging too directly on the flow; it is spread out a little by this ridge, and so meets the flame a little further up. Another successful device is due to Mr. Geo. Bray. Mr. Bray has checked the flow of air in the flame. He has placed a metal shoulder on each side of the burner, and the air is thus prevented from coming in contact with the edge of the flame for some considerable distance (about an inch) on each side of the central orifice. I light this burner, and you notice how the flame hugs the shoulder where the air is prevented from impinging against it by this metallic projection. In this way a very broad flame is obtained. The difference in illuminating power between these two—the "table-top" and the "shoulder" burner—is, I think, inappreciable. In the few experiments I have made on their illuminating power I found this burner of Mr. Sugg's to give slightly the better duty, but the difference was so small as hardly to be appreciable. The shoulder gives a little broader flame, and the other, I think, a little intenser light. Each of these gas lamps consists of a cluster of three burners, and in these clusters we have another principle coming into play—first recognized, I believe, by Mr. Bray—the augmentation of the heat of one flame by the heat of others. If we have one flame burning in the vicinity of another the two will give out more light together than they do independently apart. The sum of the two lights is increased when they are burning close together.

That is owing, first of all, to the air which passes up between the flames being heated by radiation; and, secondly, the gas itself is heated by radiation from the other flame. To put it in another way, which really comes to the same thing, the radiation from one flame is stopped by the other flame, and, therefore, each is hotter. Now these flat-flame burners have been very much improved in the last few years, so much so that there is not much difference now between the light which can be obtained from them and from the Argand burners, where the gas is burnt in a round ring under a chimney. There is one point about these flat-flame burners which I should like to call your attention to, for I do not know that it has been studied particularly by photometrists, that is the transparency of a gas flame to the light of another gas flame. In an Argand burner we have a ring of flame, so that the light from the further portion of the flame has to come through the nearer portion before it reaches us. Now it is certain that there is some loss here, but I do not know that there has been any accurate experiment made as to the loss which light suffers by going through a gas flame. I have come across one or two determinations of the illuminating power of such a flat flame as I have burning on the table—first taken from the flat side, and, secondly, taken edgeways. The difference in illuminating power is found to be considerable. I have some figures here of experiments which Mr. Harcourt made about a year and a half ago. He found that the light from a flat-flame burner was about 33 per cent. less when it was put edgeways. That is to say, if you call the light given from a flat flame 100, he got about 67 for the light coming from the edge of the flame. The flame is evidently not transparent; but I was surprised to find that the transparency is so small as it is. I made an experiment last week of this kind. An inch and a half in front of a flat-flame burner I placed a metallic diaphragm with a slot in it. I measured the value of the gas flame seen through the slot with Mr. Harcourt's pentane photometer. Next I lit a second gas flame an inch and a half further off—that is to say, three inches from the slot, and I measured its illuminating power independently. I then lit the two together, and measured the light from the two. Now, if the first flame had been perfectly transparent to the second flame, the light I should have received when burning both flames would have been equal to the sum of the two lights taken independently, but that was far from the case. In one experiment I found a loss of 24.7 per cent., and in the second case a loss of 25.4 per cent. So that we may take it that a flat flame of the thinness you see here obstructs the light from another flame to such an extent that only three-quarters of the light from the second flame gets through. The bearing of this on the relative merits of the flat flame and the Argand is at once seen. In the Argand you depend greatly on the transparency of the flame, because a great part of the flame is hidden from you by the flame in front, whereas in the flat flame it is not so. The flame is spread out over a large surface, and the light only suffers absorption in the plane of the flame.

There is another burner, also a flat-flame burner, surrounded by a globe, about which I have a few words to say. I think coal gas as an illuminant would be much more popular with English people if the makers of the globes which are commonly sold had been persuaded, or could be persuaded, to make the openings through which the air enters just about double as large as they have made them. One is accustomed to see in one's friends' houses, almost without exception, a globe with an opening as small as 2¾ inches. Openings of 2 inches are quite common, and I have seen them as small as 1¼ inches. Now, what is the effect of such a globe with so small an opening on the burning of gas? The air comes in with a rush to the flame, and is thrown into eddies, in pouring through such a narrow orifice. Consequently the flame is thrown first on one side, and then on the other, and it is in a continual state of flickering, always on the quiver, never still for half a second. It is this continual flickering when one is reading that is the chief objection to coal gas as an illuminant, as we find it in most houses. The flickering is entirely got rid of if you only have the opening big enough. Here is a burner on the table supplied with a governor, and with a globe with a large opening—3¾ inches, nearly 4 inches across, so that the air can pass into the flame with a steady flow; it is not thrown into eddies, and does not agitate the gas. Such a burner as this does not burn any more gas than a burner surrounded by the globe with a small opening.

If we want to get the best light possible from the consumption of a certain quantity of coal gas, the way to do it is to burn it in a lamp with a chimney provided with a damper; for by this means we can regulate the supply of air to the flame so as to give it just that quantity which burns the flame with the maximum quantity of light. Now the maximum light is given just below the point at which the flame begins to tail up and smoke. One should stop just short of that, and the way to do it is this: Turn on the gas and get your supply—five feet per hour, or whatever the burner is constructed for—and then turn down the air until the flame just does not smoke. In that way you get the best light from a coal gas flame.

I have here what is known as the London Argand burner; it has a ring of steatite pierced with a number of holes, through which the gas comes in little jets, which very soon coalesce into a bright ring. Then, surrounding this ring, placed a little lower than the burner, is a metal cone which causes the air passing in at the bottom of the burner to inpinge upon the flame. On the same stand I have another burner in which this argand principle, if I may call it so, is further developed. There are two rings through which the gas is burned, one inside the other, and the air passes up between the two. We have, in fact, a double Argand. The chimney has a shoulder which compresses the two annular flames. This burner requires to burn some little time before it gives a steady flame, but when it has been burning for some ten minutes it gives an exceedingly intense light, especially in the lower portion of the flame. I will leave this burning so as to get warm. The London Argand does not require any manipulation. Sir James Douglass' double Argand requires to be burned some little time before it develops a maximum quality of light, and the flame should be turned up after it has been burning a little while.

Mr. Sugg has also made Argands with more than one ring. Here I have a very fine burner with two rings and a straight chimney. You notice the chief difference between the two burners in this: Whereas Sir James Douglass has placed a conical chimney over the flame, so as to throw the air against the outside of the flame, and so compress it, in Mr. Sugg's burner the chimney is straight. It gives a very large, steady flame, but I think, on the whole, it is not so intense and white a flame as one gets from the burners of Sir James Douglass. There are, of course, many varieties of Argand burners; I could not show you all; I have only taken such as appeared to me to be the most characteristic, and, I may add, among the best that are made.

Of regenerative burners I propose to show you one—that of Mr. Bower. It is, I believe, an improvement on the Grimston burner with which I was acquainted some few years ago. By the kindness of Mr. Bower I have this lamp suspended here in the corner of the room. The lamp is what is known as a reversed regenerator—that is to say, the flame is at the bottom; the products of combustion pass up through a series of iron chambers and pass away through a pipe, and the air which feeds the lamp is drawn down past the iron chambers through which the products of combustion are passing away, and therefore is strongly heated up before it reaches the flame. The iron chambers above the flame when it is turned up become red-hot. Below the lamp is placed a glass shade to prevent the outer air reaching the flame; but Mr. Bower has found that the lamp is improved by allowing a little air to enter. He accordingly has an adjustable valve by which air can be admitted to the flame—there is a screw by which the quantity of air so entering can be regulated—and this air impinges on the lower surface of the flame. The hot air passing down through the regenerators strikes on the upper surface of the flame, whilst the cold air only strikes on the under surface. The reason for this arrangement is, I believe, that in the old Grimston burner, where no cold air came in, the glass shade underneath got exceedingly hot, and always got dimmed, as if a deposit formed upon it. Perhaps this was owing to the glass becoming partly devitrified. But with this system of admitting a bttle cold air, Mr. Bower tells me the dimming does not occur. I have not yet had an opportunity of experimenting with this the latest form of the Grimston lamp, but I am assured that it gives a duty—that is to say, an illumination per cubic foot of gas burned—of something like seven or eight candles; if so, I can only say it is a most marvelous lamp, and I look forward with great interest to measuring it photometrically.*

About the relative merits of coal gas, oil and electricity as illuminants, I do not propose to speak to you this evening; I am only concerned with coal gas itself; but I have written up on the blackboard a few statistics concerning the cost of artificial illumination, for which I must apologize if they are out of date. In the first column are the names of the illuminants; in the second column the price per lb., per gallon, or per 1,000 cubic feet of the illuminating material; and in the third column the cost per hour of lighting a room of moderate size well—that is, giving it an illumination of 25 candles. The table was drawn up from the results of photometric experiments by Mr. Vernon Harcourt:

	Per lb.	Cost per hour.
Spermaceti candles	—	9¼d.
Stearine	—	4¼d.
Sherwood wax	—	2¼d.
	Per gall.	
Alexandria oil	1s. 10d.	¼d.
Colza oil (in moderator lamp)	4s. 0d.	1¼d.
	Per 1,000.	
Flat-flame gas burner	—	¼d.
Large Argand "	—	¼d.
Siemens regenerative burner	—	0.2d.

*Since this lecture was delivered I have tested the 25 feet Bower lamp by Mr. Harcourt's pentane photometer. The light given by the burner in a horizontal plane, burning 27.1 (corr.) cubic feet of 16.5 candle gas per hour, was equal to 182 candles. This is equal to 6.7 candles per cubic foot, or 6.5 candles per cubic foot of 16 candle gas. The cost of obtaining an illumination of 25 candles from this burner, burning 16 candle gas, would be 1-7d. per hour. I must add that below the horizontal plane the intensity of the light increases.

I will now show you a still more brilliant gas burner at the other side of the room. One purpose for which a very brilliant light is required is for the beacons on our coast which warn sailors when they are approaching the shore, and guide them through the tortuous channels round our island. Of these burners those invented by the engineer of the Trinity House—Sir James Douglass, and those of Mr. J. R. Wigham, of Dublin—rank in the first class. This burner of Sir James Douglass is burning ordinary coal gas here, but it was devised to burn a richer cannel gas. In it the Argand principle has been repeated six times; we have six rings of flame, one outside the other. Each ring has a separate tap by which the flow of gas to it may be regulated, and it has the same cone-shaped chimney which Sir James Douglass adopted in the smaller Argand on the table. Owing to the shoulder in the chimney the air is thrown against the flame, and we get a very much intenser light than we otherwise should; and not only that—and this is the point of greatest importance—we get the flame contracted into a smaller body than we otherwise should get it. This inrush of air all round pushes the flame together. I think the actual contraction makes the flame brighter; but when such a flame is placed behind a lens, the nearer you can bring all the light to one focus, the more truly can you send out the refracted rays parallel, and therefore the less scattered the beam from the lantern will be. The smaller the flame the better the result with the lens, and this is the reason, I think, why these burners are so successful when shown in a lighthouse lantern. The particular thing to notice about this burner is the exceedingly bright zone of light about one inch above the metal base. This zone is placed in the focal plane of the lantern, and the light from it is most accurately focussed by the lens, and the refracted rays sent out parallel. Using such a lamp as this in one of the experimental towers on the South Foreland, and placing in front of it a lens six feet high by four feet broad, I found on a clear night, at a distance of about two miles, that the light received from it by a photometer disk was equal to the light from over 90,000 candles, the burner consuming only 96 or 97 cubic feet of cannel gas per hour.

Speaking of the experiments at the South Foreland naturally leads me to one other topic, not perhaps directly connected with the subject, but one on which those interested in gas manufacture will perhaps forgive me for saying a few words—that is, the standard of light to be used in testing gas flames. Two or three standards of light have been devised, and one has successfully stood the ordeal of trial. I refer to the pentane standard of Mr. Vernon Harcourt. But one objection has been urged against this standard which neither Mr. Harcourt nor others who have experimented on the subject have been able fully to meet. There is a doubt whether the light produced by the pentane flame, two and a half inches high, varies with the height of the barometer. It may be true that this has little concern for testers of coal gas, for the coal gas itself may suffer an exactly similar variation. As the coal gas goes up, so may the standard; and consequently the readings may be concordant one with the other under different conditions of atmospheric pressure. But when we come to consider a standard of light, such as is required in many physical experiments, it at once strikes us that a standard which may vary with the variations of atmospheric pressure can not be an absolute standard.

You all know that an absolute standard has been proposed in France, and, indeed, accepted by an international commission on standards—viz., the light given by a square centimeter of platinum at the melting point. I need hardly remind any of you who have worked with melted platinum, or seen it, what an exceedingly awkward standard this is. Not only is it exceedingly awkward to work, but as the platinum passes from the melting to the solid state, as it crystallizes on the surface, the amount of light which it radiates varies very considerably. The platinum standard yields a constant light, I believe, for about the space of a minute and a half. The only use of such a standard would be to standardize something more useful and portable.

But I venture to think there may be another method of obtaining a constant light which may not be subject to variations of light with variations of pressure. I refer to an electric glow lamp with a very high resistance compared with the light that it gives out, connected with a battery, and some instrument for accurately measuring the strength of current flowing through the circuit. I have lately been experimenting with such a lamp in conjunction with Mr. Vernon Harcourt. In the experiments I have referred to at the South Foreland, where we have often to measure the light from the lighthouses through an opening in the shutter of a hut exposed to the full southwest winds, we have found it exceedingly difficult at times to work with the pentane standard, and we have been anxious to devise another standard, which we could standardize first of all with the pentane, and then use. We have only lately had an apparatus of sufficient delicacy constructed, but as far as our experiments go this standard promises to be of some use in future photometry; and I have brought it before you this evening, so that anyone engaged in photometry may have an opportunity of examining it before it goes down to the South Foreland.

Here is a glow lamp of about ten ohms resistance, and it gives a light of about one candle with a current of one ampère. The life of such a lamp as that, I think, may be a long one; we may look forward to it out-living many of its brighter brethren which give a light of from fifteen to fifty candles. This one is content with giving out only one candle light. Here I have a simple form of rheostat—a wooden cylinder and a brass cylinder, on which a German silver wire may be wound from one to the other, so as to alter the resistance of the circuit. I pass the current, first of all, through this electro-dynamometer, which tells me the strength of the current. The current goes through a fixed coil of copper wire, and also through a movable coil suspended inside the other. The movable coil suffers attraction when the current passes and turns round against the torsion of a wire. By a milled head at the top, I can put so much torsion into the wires as to bring the coil back to its original position of zero.

The method of working is this: The pentane flame is brought up to its normal height of 2½ inches; the current is sent through the dynamometer, through the rheostat, and through the lamp; and the resistance of the rheostat is altered until the light is equal to that from the pentane. Then the reading of the scale is made. This gives the torsion in this wire, and the square root of that is proportional to the strength of the current. By turning the rheostat to the right or left, the amount of current flowing through can easily be regulated, and so the light adjusted to that of the pentane. Here are some of the readings taken last week. We were particularly anxious to take readings with a low barometer, and on two days last week the barometer fell to 29.3 inches. The following are four readings on different days:

Barometer. Inches.	Dynamometer Scale.
29.3	1,204
29.5	1,212
29.6	1,225
29.7	1,238

You notice there is a regular increase in the scale readings with the rise of the barometer; but as yet we have only had this small range of four-tenths of an inch. Let me point out a very curious coincidence in these numbers. I said just now that the square root of the scale readings is proportional to the strength of current. Let us take the square root of the two extreme readings:

$$\frac{\sqrt{1238}}{\sqrt{1204}} \text{ is } \frac{1014}{1000}.$$

That is, the strength of the current is 1.4 per cent. greater in one case than in the other. Now, what is the difference between the two barometer readings? The ratio $\frac{29.7}{29.3}$ is also $\frac{1014}{1000}$, or a difference of 1.4 per cent. I do not wish to speak positively on this point, as there are several conditions which might affect the scale readings—such as changes in the torsion of the wire, or in the transparency of the glow lamp. Our experiments with the apparatus have only just begun; but they seem to point to slight changes of light from the pentane flame with variations of the barometer—changes just perceptible with such an instrument as this, but totally inappreciable by any method of measuring light by a gas flame.

Next week I propose to consider those flames which have been used as a source of heat, and those which, by heating up a solid substance to incandescence, have been used as sources of light.

SPECIAL ENGLISH CORRESPONDENCE.

Communicated By Norton H. Humphrys.

Salisbury, Jan. 10, 1885.

I have more than once alluded to the increased interest evinced by the general non-professional public in the uses of coal gas, and regarded it as a satisfactory sign in the interests of the gas industry; for coal gas is a commodity that will stand any amount of investigation, and the result of studying its properties will be that an increased demand will arise for improved appliances. Englishmen are proverbially intelligent on matters that touch their pockets; and the result of this increased interest will be that gas consumers generally will perceive how to avoid those fruitful sources of discontent and complaint—high gas bills—by the use of burners and fittings properly designed for utilizing the full value of the gas consumed; and the blame that has been bestowed, frequently with no unsparing hand, upon gas and gas companies will be diverted to the true cause—to the burners which do not develop more than 30 or 40 per cent. of the standard illuminating power of the gas, and stoves that waste the heat by imperfect combustion, or by diverting it up the flue pipe, or anywhere else but the place where it is wanted.

Holding this opinion, it will be obvious that I regard with great satisfaction, as a sign of the above interest alluded to, the fact that the Society of Arts, an old established and influential society, formed for the promotion of

general technical education, has selected the subject of "The Uses of Coal Gas" for a series of three lectures during the present session. A gentleman whose name is familiar in connection with the gas affairs of London, Mr. Harold B. Dixon, M.A., was selected as the lecturer, and the lectures were delivered on the 1st, 8th, and 15th ultimo, respectively. The committee have every reason to congratulate themselves upon their choice, for Mr. Dixon was certainly happy in placing before the public a large amount of useful information respecting the properties of gas, and the proper ways of using it either for lighting, heating, or cooking, delivered in that light and easy conversational style which is indispensable to the successful exposition of scientific subjects before a mixed audience. The information is not merely interesting, but of undoubted practical value to all users of gas. It comprises many points which gas engineers and others have repeatedly brought to the notice of their customers, who have frequently received them, however, with but little attention, regarding them as a "sprat to catch a mackerel," and betraying some little suspicion that the ultimate end in view was the swelling of the gas bill; but when uttered from an independent platform, by an undoubted authority on the subject, it will attract the attention which it intrinsically deserves.

A report of these lectures has been specially prepared and undergone revision by the lecturer for the pages of the *Journal of Gas Lighting*, and published in the present numbers of that magazine. Although necessarily comprising much that gas engineers are already familiar with, it furnishes very interesting reading, by no means devoid of value, for the use of the profession. It frequently happens that the time bestowed upon the study of a subject with which we were previously (or conceived ourselves to be) perfectly familiar, is not altogether wasted; and in the present case the reader will find some additional light shed upon well-known debatable matters in connection with the gas industry. The first lecture* deals with the physical properties of coal gas as supplied from the mains; such as its inflammability, specific gravity, and diffusive power; its principal constituents, hydrogen, marsh gas, carbonic oxide, ethylene, carbon bisulphide, and the quantity of oxygen or air required to consume them, also the resulting products of combustion; its exploding force, including the velocity of the explosive wave, and the proportions of gas and air that are necessary to secure an explosive mixture, the limit being shown by experiment to be about 3½ to 9½ parts of air to one part of gas; the effects of the products of combustion, including the sulphur compounds, as regards ventilation. "Coal Gas as a Source of Light"† is the subject of the second lecture. Besides noticing the constituents that confer the property of burning with a luminous flame on the gas, considerable prominence is given to the important practical subject of the effect of pressure on the illuminating power, in connection with which it is recommended that when the tap is used as a regulator, such as obtains when the gas is supplied at such a pressure that the tap is only required to be, say, about half-way on, it should be situated two or three feet away from the burner; as under these circumstances a swish or eddy is produced by the passage of the gas through the small opening in the tap, which is liable to produce an unsteady flame, unless the current has an opportunity of quieting down into a steady, easy flow before reaching the burner. The utility of pressure regulators or governors, either applied at the service pipe or at the burner, is referred to. The information respecting the transparency of gas flames is also of great practical importance. Mr. Dixon found that an ordinary flat-flame burner obscured 25 per cent. of the light given off by a second burner placed behind it. Several different kinds of burners were exhibited and explained. It was also shown, on the authority of Mr. Vernon Harcourt, that, for equal amounts of light, gas is five times as cheap as oil, and ten to forty times cheaper than various kinds of candles. The third lecture treats of coal gas as a source of heat, and deals with various means of cooking and heating by means of gas. And, by way of a postscript, a practical illustration is given. A friend of the lecturer uses gas entirely for cooking, and for heating all the water used in the house for a household of eleven persons, using one large cooking stove, one boiler, five Bunsen burners, and two water heaters. These have been in constant use for three years, and the average cost per annum, which includes twelve ordinary lighting burners, also in regular use, with gas at 64 cents per 1,000 cubic feet, is $140.

For some years past Messrs Bradbury & Hirsch, artificial manures merchants, of Liverpool, have made a practice of issuing an "Annual Review" at the commencement of each year; and this publication has attracted attention in gas circles as comprising a well written statement of the state of the sulphate of ammonia trade, not merely comprising a list of prices, but considering fully and at length the various causes that have tended to affect the operations of the year, and also future prospects. I have just seen a copy of the review for 1884, just issued, in which no less than 14 pages (quarto size) are devoted to the subject of sulphate. The present low state of the market is attributed to the operations of unscrupulous speculators, respecting whom some deservedly caustic remarks are made; it is shown that over production has not existed, and the supposed competition of nitrate of soda as a rival manurial agent, if it has affected prices at all, is not of much importance. The total production of sulphate in the United Kingdom is estimated at 87,000 tons, of which quantity only 1,500 tons are put down as from sources other than gas works; of this quantity it is calculated that about 65,000 tons are exported to the Continent. As instancing the great fall that has been experienced lately in the value of sulphate, I may quote the average prices during the last three years:

1882.....	£20 8s. 6d.	per ton.
1883.....	16 11s. 0d.	"
1884.....	14 9s. 3d.	"

From which it appears that the average price obtainable during the past year is only 70 per cent. of that which could be secured only two years previously.

A new departure in the way of differential rates for gas has been inaugurated for the new year by the managers of a small undertaking near Bristol. The directors of the Keynsham Gas Company have notified their consumers that in future the price of gas will be 5s. per 1,000 cubic feet to consumers of not less than 1,000 cubic feet per quarter; from which it appears that smaller consumers using less than this very moderate quantity will be mulcted in the previous price of 5s. 6d. And also that any excess of consumption over the amount used in the corresponding quarter of the previous year will be charged at 4s. 2d. per 1,000 cubic feet. The proprietors of small gas undertakings—not being encumbered by Parliamentary obligations, and being practically as safe from the risk of competition as they would be if backed up by Parliamentary authority, seeing that the amount of business they do is too small to attract the attention of enterprising and not too scrupulous speculators, who might otherwise be inclined to make things rather hot for the existing company—enjoy a perfect freedom of action as regards the arrangements they choose to make with their customers. The new arrangements now advertised by the directors of the Keynsham Gas Company, so far as I know, are quite novel and unprecedented.* Being personally unacquainted and perfectly ignorant as regards any person connected with that company, I feel quite at liberty to freely criticise them. They are certainly worthy of careful consideration, and it is possible that they may be found to be suited to the requirements and interests of many other small undertakings. To say the least, they indicate no small amount of astuteness. As to charging small consumers a higher price, a good deal of sentiment may be forthcoming about having one price for the poor and another for the rich; but gas undertakings must be conducted in accordance with the usual rules of commerce, and these have long since decided that the purchaser on a small scale must pay more than the buyer on a large scale, and that ounces or pounds cannot be retailed *pro rata* according to the price per hundred weight. Further, my own experience has led to the opinion that even if consumers of less than 2,000 cubic feet per quarter were charged 10 per cent. above the regular price, they would still contribute less than their fair proportion to the profits of the company; not only because they entail a larger proportion of office expenses, but also because of the larger proportion of bad debts, "slow" meters, leakage, not to add stealage. Seeing that only one small burner in regular use for three hours per diem would exceed the limit of quarterly consumption above named, it seems that only under exceptional cases should the consumption be less. Turning to the second innovation—the reduced price for any excess of consumption as compared with the corresponding quarter of the previous year. This is the same thing as the offering of a premium of 20 per cent. on new business, which is a very good plan, provided the *bona-fide* new business could be fairly sifted out; this, however, is rather a difficult matter. A customer commencing to use gas for the first time, or one who did not use any gas at all during the corresponding quarter of last year, as might be the case on account of absence from home, might claim, according to this arrangement, to have the whole of his supply charged at the reduced price of 4s. 2d. And the consequence would be that regular customers who had used gas constantly from one year's end to another, perhaps for the last quarter of a century, would claim, and with a considerable show of justice, that they had as much right, or even more, to the favorable consideration of the company as the new-comer or the irregular customer. So it appears that this plan is likely to be attended with many difficulties in practice.

The weather has been more favorable to the gas industry during the last two or three weeks than in the earlier part of the winter. We had a long and a mild autumn; but with Christmas time there set in not particularly severe cold, but dry and frosty weather, with a continual dull and cloudy atmosphere that entailed dark mornings and evenings and shortened the hours of daylight. Consequently the general experience has been a brisk demand for gas, and coming just at the time of maximum consumption, this has en-

* See JOURNAL, issue of Jan. 16, pp. 33-36.

† See JOURNAL, pp. 61-63.

* Mr. Humphrys undoubtedly means that his statement regarding the novelty involved in the Keynsham differential rates only applies to European countries. American gas managers have had plenty of such examples set before them in this country.

tailed some inconvenience where the plant is already worked to its full capacity. A fair trade is being done in coke, but there has not been a sufficient degree of continued cold to create a brisk demand.

The Siemens Regenerative Burners.

[Dr. Otto Götze, who is connected with the establishment of Messrs. Friedrich Siemens & Co., at Berlin, read the following paper before the German Association of Gas Engineers at the Mid-Rhine meeting of that Society. We are indebted to *Gas and Water* for the translation.—Ed.]

The lamps at present sent out by Messrs. Friedrich Siemens & Co. are pretty much like those which have been for some time well known, but there are some substantial improvements in their construction. The former soldering is quite abandoned, and the whole lamp, the cover as well as the exit-tube and the chimney top, are made out of cast iron or wrought iron, and the whole united into one solid piece. The new models present the following points for notice:

1. The possibility of centering all the essential parts, and of fixing them in that relation. The mouths of the small burner tubes are fixed in an iron circle; while formerly the circle which bound these tubes together yielded somewhat to their pressure, and the circle of tubes became, therefore, slightly eccentric. The outer cover is made of cast iron at the end exposed to the flame; it can therefore be turned upon the lathe, and is not distorted either by transport or by use; which could not always be said when this part of the lamp was made of plate.

2. The upper part of the regenerator can, without trouble, be taken off and replaced by another. When the lamp is at work half this part is red-hot, and therefore in time becomes rusty, burns away, or becomes distorted. It is of importance, also, that repairs should be effected with ease. The former regenerative parts, screwed in, were found, after somewhat prolonged use, to be difficult to remove without affecting the whole construction, and in that case it was out of the question to effect any repairs on the spot.

3. The gas chamber is separated from the regenerator, and is entirely made of brass, for the great heat induced leakages in the gas chambers of the older construction, in which brass was connected with iron. Here, too, it was necessary, in order to effect repairs, that the whole lamp should be removed.

4. By unscrewing two screws, ¼ inch in diameter, the whole lamp can be taken to pieces. It is thus possible for all to examine the construction, to find out what is the matter when things do not work well, and with little trouble, in many cases, to correct that which is at fault; all of which was impossible in lamps of the older form.

I shall now pass on to give some of my own experiences as to the working and use of these lamps. As far as the experience of gas managers in the use of these lamps for public lighting is concerned, I may, for the most part, appeal to themselves. Hard and fast rules as to the sizes which ought to be chosen for particular cases it is impossible to give, for the requirements of different places vary, and the amount of light which for one place would be sufficient would for another place fall short of the demand for brilliant illumination. When we have to do with the lighting of street areas and the crossings of crowded streets, sizes between II. and III. may be chosen. These sizes may be fitted up on the ordinary lamp-posts, as in Berlin, or may be set up on posts specially constructed for them, as in Basle, Thorn, and other places. For the illumination of great squares, on the other hand, where the area to be lit up is more extended, it is recommended that the lamps be placed high, on special lamp-posts. For large squares the size II. will seldom suffice; one or more of size I. will be required, according to the dimensions of the square. Higher numbers than I. it will only be advisable to use for public lighting when any other system of lighting will give rise to complaint, or when the dimensions of a square, surrounded by buildings, permit the use of reflectors, or when the bent lateral tube of sizes I. and II. is objected to on artistic grounds. These cases excepted, it is better to use a larger number of medium sizes, because the utility of the light produced would otherwise fall short as compared with the amount of gas consumed. We would in such a case fall into the error with which the electric arc has been justly charged. Complaints have repeatedly been made that the pipes leading straight up to the lamp have become frozen. To obviate this difficulty, as well as better to preserve the cylinder, it would be well, in the first place, to extinguish the lamps by two successive turns, so that the cooling may not be too sudden. Again, it is advisable that in all new constructions the stopcock and regulator should be in a pit some seven feet from the lamp-post, and should be laid in the course of the horizontal piping; then between the lamp-post and the lamp the two pipes—the one for gas supply, the other for self-lighting—should both be surrounded by a wider copper or patent welded tube filled with slag-wool. The self-lighting pipe must then, of course, travel from the pit. This pit must be at least 7 feet from the lamp-post, in order that the lamplighter may see what he is about when turning the flame up or down.

What I have said about public lighting applies equally to the lighting of works and railway stations and yards. Gaslighting in railway stations seems to demand some attention, for this is the field in which the contest between gas and the electric light is most animated. The advantages of the intensive gaslighting over arc lighting may probably be expressed in the following way. I have special railway establishments in my mind, but the following propositions apply generally: (*a*) Smaller outlay; on the average one-fifth. (*b*) The power of using the existing sources of gas to light up various districts in various ways as the demand arises. (*c*) Cost no higher, even when gas is bought; if a private gas works be resorted to the cost is much less than that of electricity. (*d*) Possibility of modifying the sizes of burners to meet temporary needs. (*e*) Greater security. (*f*) Lighting and extinction of particular lamps, adjustment of each flame to the amount of light required. (*g*) Less depth of shadow. (*h*) Possibility of carrying away the heat of gas flames in closed rooms, and of effecting thereby a very thorough ventilation. What has been said above as to the use of single lamps for public lighting applies generally to large areas of all kinds in which, as in works, it is sometimes of great importance that there should be no shadows. For railway stations the lamps should be more numerous and raised to a height of from 20 to 23 feet for waiting-rooms, vestibules, etc., in which we have the reflection from the walls to depend upon. Single lamps of higher power may with advantage be employed. In connection with this it may be remarked that the experiments conducted in Upper Italy, at the railway station of Alessandria, have been so decisive that in the course of this year Genoa, Ventimiglia and Bologna have arranged for intensive gaslighting, and in Bâsle the electric lamp has been dismissed from the central railway station, and regenerative lamps ordered. At the railway station of Dirschau each shed has its own branch pipe; the stopcocks corresponding to all the sheds are brought together into the same place, and all the gas lamps have an independent self-lighting supply. The stopcocks of the individual lamps remain always open, and are only once adjusted so as to secure an equal height of flame for all the burners. In this way the opening and closing of one master stopcock brings the whole gas lighting thoroughly under control; and this can thus be rendered extremely economical—a matter of great importance to railway stations and yards. The system has also found its place in post offices, sorting rooms, etc., though perhaps not so widely as might have been wished; and also in several universities, academies, technical schools, and so forth. These lamps of our construction have also been used for harbor lighting, as in Friedrichshafen, Geestemünde, and Stralsund; and for lighthouses, as at Bremershaven. The most diverse works—rolling mills, forges, coke works, and so on—have set up regenerative lamps; and in many works the use of single lights has to a great extent given way to a general illumination by these lamps. Instead of eight jets 4 feet 2 inches apart, a single regenerative No. II. may be employed. In high rooms single jets have frequently been replaced by a general roof illumination; but when the room is low it is better that the walls be lit up. Some kinds of works present special points of interest. In dye works intensive burners do better than the arc light, because the light comes better through steam; and besides, the gas burners can be used to get up ventilation and remove this steam, for which purpose the roof is pierced, and a wide tube let through it; the tube which brings up the products of combustion from the gas lamp is pointed at the top, and the heated gases run smartly through its apex; this rapid stream sucks air out of the room, after the manner of an injector.

For chemical works, in which inflammable substances have to be dealt with, a safety lamp is constructed, which Messrs. Meister, Lucius and Brüning have set up with the best results in many cases where the illumination had previously been from without. In spinning factories the system has not made much progress, with the exception of Upper Italy, where whole factories are so arranged, and with the best results, both financial and illuminative. Among others, the factory of Carlo Raggio, in Novi-Lagure, saves 25 per cent. of gas, while getting a better light. For jute spinning and weaving, and for spinning all white fibers, the intensive light is well adapted. For offices the steady light and good ventilation have rendered it very suitable. For shops of different kinds, such as jewelers or German silver shops, ironware, hardware, knicknackery shops, florists, confectioners, butchers, drapers, and especially for shops the contents of which are liable to tarnish, or to be spoiled by the products of combustion of gas, the regenerative system is a necessity. For example, the polished steelware works of J. A. Heurrels, of Solingen, has a shop in Berlin which has been lit for three years by regenerative lamps. The firm has benefited by a large yearly saving, besides having a better light, for its goods do not now tarnish in the least. Under the old system of open gas flames the whole stock had to be taken down, cleaned and polished up once a fortnight at least; now they have absolutely ceased this manipulation. A similar result has been obtained by Messrs. Koch and Bergfeld, silverware works, Bremen. In closed rooms where gas is used, if the regenerative burners be employed and the products carried away, living plants may be kept in the room, as the experience at

the winter garden of the Duke of Coburg-Gotha, at Gotha, serves to show. When lamps are suspended from the roof, it is recommended that they be suspended in such a wise that they can be let down to the ground, or else that some means of access be provided from the roof.

British Gas Undertakings.

The following interesting details concerning the above subject are reprinted from the *Journal of Gas Lighting:*

The Parliamentary Returns for 1883 relating to all authorized gas undertakings in the United Kingdom—separating those belonging to Companies from those controlled by Local Authorities—have only just been issued, although the Order of the House of Commons for printing them was made on May 27 last. This delay is regrettable for many reasons; and it is hoped that arrangements may be made in future for the more speedy appearance of these very valuable statistics. Apart from their age, however, the returns are in many respects an improvement upon their predecessors. Taking the Companies' return first, the form has been enlarged by the addition of two headings, increasing the number to 24; while the particulars of others have been modified. In the last return the charges for meters were inserted in the same column as the prices of gas. But this arrangement was not as clear as might have been wished; and so the meter rents now form a separate entry, which is an improvement. The other additional column is for the length of mains in miles—an interesting contribution to the statistics of gas supply, and one that throws a side-light upon the position of a good many undertakings. A slight but not unimportant alteration is made in the column stating the illuminating power of the gas supplied, which is now that furnished by official tests, and no longer left, as was possible under the earlier form, to the unverified statement of the providers.

Generally it may be said that the latest return is fuller than those which have preceded it. The failures to return are reduced to two in England—Chapel-en-le-Frith and Kirkham; and one in Ireland—the Cork Consumers' Company. The omissions, therefore, do not materially affect the totals furnished at the end of the list, although it would naturally have been more satisfactory had the entries been regular throughout. It appears, moreover, that some of the Companies making returns have been unable to fill in all the columns (the mileage of mains is not available in 46 instances); and in other cases the figures are qualified as estimated, or prefaced by the suggestive word "about." On the whole, however, taking into consideration the extent and bearings of the information required, the response of the Companies to the Order of the House has been loyal and complete.

Before proceeding to show the details of the return relating to Companies, or to examine that relating to Local Authorities, it will be convenient to cite the totals in respect of both classes of undertakings, for comparison with each other and with the figures referring to the previous year. The gross amount of share and loan capital authorized for the gas companies of the United Kingdom, at the end of 1883, was no less than £48,153,985; of which the sum of £34,114,530 was actually paid up or borrowed. Similarly the local authorities of the United Kingdom had power to raise £21,163,139 for this purpose, and had actually raised £17,874,351. Adding these two classes of statistics together, we find that the grand total of capital authorized for gas supply in the United Kingdom was £69,317,124; of which £51,988,881 was actually raised and employed. The return for 1882 showed that the companies could then raise £46,906,701, and the local authorities could borrow £20,911,154; while the amounts actually raised by them were £32,934,935 and £17,326,183 respectively, giving grand totals of £67,817,855 of authorized, and £50,261,118 of employed capital. The increase for the year was therefore £1,499,269 in authorized, and £1,727,763 in employed capital; apparently indicating that legislative authorizations were not keeping pace with actual requirements. The increase of the companies was £1,247,284 in authorized, and £1,179,595 in employed capital; the increase of the local authorities being similarly £251,985 and £548,168. These figures are significant. They indicate a more rapid extension, involving a heavier drain upon the resources of the companies as compared with the local authorities; and as all the new capital must necessarily have been raised under the auction clauses, there is every possible guarantee that it was in each case kept down to the lowest amount that would satisfy current requirements. The same figures also show that the local authorities are not taking the "lion's share" in the general increase of the gas interest of the country, but that, when comparison of one year with another is not seriously affected by transfers of undertakings, the great mass of gas companies, comprising a number of small concerns, have decidedly more than their proportional quota of elasticity.

Comparisons based upon considerations of capital alone require to be supplemented by others drawn from records of what is done for the money. Here, however, the imperfections of the returns, such as they are, introduce a slight amount of error. Naturally, it is easier to obtain returns of capital obligations than of other data which are in general less rigorously settled. Still, the Board of Trade officials have carefully made up all the totals that could be added, and the following are the results:

In 1883 about 7,631,304 tons of coal were carbonized by all the statutory gas undertakings of the Kingdom, producing altogether 76,837,967,813 cubic feet of gas, of which 70,116,324,062 cubic feet were sold to 2,019,846 consumers and for lighting 375,536 public lamps. There is no ready means of ascertaining the population of the districts occupied by these undertakings, or it would be interesting to note the average consumption per head. In the previous year 7,280,757 tons of coal were carbonized, and 72,583,343,401 cubic feet of gas were made, of which 66,613,943,898 cubic feet were sold to 1,971,971 consumers and for 361,311 public lamps. The increase for the year was therefore 350,547 tons of coal carbonized; 4,254,624,412 cubic feet of gas made, and 3,502,380,164 cubic feet sold; 47,875 consumers, and 14,225 public lamps. That is, the increased carbonization of coal was at the rate of 4.81 per cent. on the return for the previous year, the production of gas increased at the rate of 4.46 per cent., the consumption of gas increased by 5.25 per cent., the increase in the number of consumers was 2.42 per cent., and in the number of public lamps 3.93 per cent. It will be observed that the rate of production of gas also rose from 9,969 cubic feet to 10,068 cubic feet per ton; being a surprisingly high rate for such a mass of works taken all together, great and small, from all parts of the Kingdom, and using all varieties of coal. It is very satisfactory to find that the rate of increase was greater in regard to the gas sold than in the gas made. This points to a progressive diminution of the unaccounted-for gas. The comparatively slight increase in the number of consumers also shows that a great deal of the increased consumption was due to a real expansion of business done with existing consumers, and only a portion of it with new patrons. The steady increase in the number of public lamps shows not only that our towns are growing on all sides, necessitating the formation and lighting of new roads, but that the position of gas as a street luminant has not been weakened, but rather strengthened, in face of an active competition.

It would be possible to draw many proportional comparisons between the totals compiled from the companies' and local authorities' returns; but such results would, in the main, be more curious than instructive. It may be placed on record, however, that of the gross bulk of gas sold in the Kingdom the companies supplied 68.18 per cent. and the local authorities 31.82 per cent. For the previous year the ratio was 68.28 and 31.72.

Coming back now to the return of the companies, it appears that their total authorized share capital at the end of 1883 amounted to £39,060,992, of which £29,038,726 was paid up. The authorized loan capital, including debenture stock, was £9,092,993, of which £5,075,804 was borrowed. The amount of borrowing power remaining in reserve was therefore considerably more in proportion than the ratio of unused share capital. Of the authorized capital, £9,339,760 is subject to the auction clauses; and £2,538,709 of this has actually been raised, the premium upon which was £1,088,675, or an average of nearly 43 per cent.

The total length of mains given in the statement is 11,914¾ miles; but, as already stated, this is passing over 46 works which cannot give their mileage. The average mileage of these undertakings may range from 5 to 10, as they are not large; and if the latter were taken—which would probably be a liberal estimate—it would bring up the total mileage for the gas companies of the United Kingdom to 12,374, and the works that do not make any return would increase this to about 13,000. Few undertakings have more than 50 miles of street mains charged; and the influence of mileage upon price may be detected on the surface in a good many of the entries. Thus, the Gas Light and Coke Company (before the amalgamation with the London Company) had 1,730 miles of mains for 198,290 consumers, or 114.6 per mile. The South Metropolitan Company had 61,009 consumers on about 670 miles of mains, or about 91 per mile. The Dublin Company, however, had only 16,917 consumers on about 600 miles of mains, or less than 30 per mile. It is, evident, therefore, that in this respect the conditions of the undertaking supplying the Irish capital cannot possibly be so favorable as those of the Metropolitan companies. Taking a celebrated low-price company—the Plymouth—there are 8,540 consumers on 49 miles of mains, o nearly 174.3 per mile. It does not follow, however, that this matter of cheapness and close packing is a rule without any exception, for in some localities, with from 300 to 400 consumers per mile, the price is not conspicuously low. If it were possible to co-ordinate the number of consumers with the bulk of gas sold to the mileage unit, a more trustworthy rule might be deduced. This could be easily done with a few selected examples; but not with a mass of returns such as those now before us.

We have on previous occasions examined these statistics, and pointed out the largest and smallest of the undertakings, the dearest and cheapest gas, etc.; wherefore it will be unnecessary to do the same now, for a year or two does not bring much change in the relative positions of concerns of this order. It will suffice to say that the growth which is manifested by the totals relating to their operations is fairly distributed among them; and the

prices stated for gas have in very many instances been reduced in comparison with the figures belonging to the previous year.

The return relating to local authorities' gas undertakings has also been enlarged, and the form improved. The additional headings are to the same purport as those inserted in the companies' return, and relate to meter rents and mileage of mains. Many of the returns are made up to March 25, 1884. The general totals of the operations of these undertakings have been already dealt with. The financial data are a little more mixed than in the case of the companies; and the application of the profits is very erratic. The length of mains belonging to local authorities is entered as 6,053¾ miles, and the information was not forthcoming in 20 instances. Adding this figure to that of the companies' return—making a similar allowance for the missing measurements—we obtain 19,100 as the probable extent in miles of the gas mains of the Kingdom; and every portion of these must by law be maintained full of gas and under a sufficient pressure and in sufficient quantity for any demand that may be made by the inhabitants of the district through which the mains pass. It is a great obligation; and the ease and certainty with which it is discharged should not lessen, in the eyes of an observer, the magnitude of the mental and physical work involved in the duty.

Something About Lime and Cements.

The London *Builder* is publishing a series of articles on "Lime, Cement, and their Uses," intended for the better information of the student in these materials. The articles in question are quite well worthy the attention and thought of other than students, as they contain a number of practical and valuable hints put in language entirely divested of technicality. We extract the following:

"The principal difference to be observed between lime and cement is that whereas lime has strong adhesive powers and small cohesive powers, cement possesses the reverse properties. Lime, therefore, is improved in strength by the addition of a suitable sand, while the strength of cement is greatest when it is used by itself. To determine the constructive value of a sample of lime by means of laboratory or testing-room experiments is much more difficult than the carrying out of an ordinary cement test. In fact, such tests are seldom adopted, for from a knowledge of the components of the limestone from which the lime is burned, and from its general appearance, a very just opinion can be formed as to its suitability for the work for which it is intended to be used, and it is only necessary to insure that it is worked in a proper manner.

"When, however, a test is made, it is simply the hardness which the sample attains after gauging that is determined, and this is done by what is known as a Vicat needle. A Vicat needle is an instrument consisting of a needle with a flat point fixed to a light rod, which slides in the framework of the machine; the needle being weighted to the required amount, is allowed to fall from a certain height on to the pat of lime, and the indentation measured by means of a Vernier scale on the guide-rod. It is usual to make the pat to be tested of one part lime to three parts of clean, sharp sand, about three in. square, and at least 1½ in. thick. The needle should have a diameter at the point of 0.1 in., and should weigh with the rod and attachments 4 ounces; the fall should be six inches, and the experiment carried out seven days after making the pat.

"The knowledge of the analysis of the limestone (or even generally its geological position) from which the lime under consideration has been burned, will at once decide whether it is a rich or hydraulic lime, and an examination will decide if it is well burned and fresh. The matter of burning can be, in the matter of rich limes, easily determined by taking a small piece of it, dipping it into water, and then putting it on one side for a short time. If it all falls to a white impalpable powder it is a sure indication that the lime is properly burned. If, on the other hand, hard lumps remain, this is an indication that it is not well burned, and a few more pieces should be taken from different parts of the bulk and the same experiment carried out. The foregoing, it need not be forgotten, refers to rich limes only; the hydraulic and eminently hydraulic limes take a much longer time to "slack," some of them as much as a week or ten days, or even longer; in fact, from the difficulty experienced in "slacking" them, they are generally ground to facilitate the operation. The freshness of the lime is essential, because lime that has become "killed" by absorption of the carbonic acid from the atmosphere will not make good mortar. If all the lumps of lime have clean, sharp edges without cracks or any indication of powdering it is in a perfect condition for use. Lime is supplied from the manufacturer as "lump" lime or ground. The rich limes are generally supplied as lump lime, and the hydraulic limes are generally ground; but, unless it is to be used at once, it is preferable to have it in lumps, as in that condition it will keep a longer time in good condition.

"Roman cement, plaster of Paris, parian, and Keene's cement, though not used for purely such constructive purposes as are lime and Portland cement, are still of the same category. Roman cement was the immediate forerunner of Portland cement. It was no doubt called Roman because it was thought that in it had been rediscovered the cement used by the Romans, and to which age has given such a high reputation; it is, however, needless to say that the Romans were innocent of Roman cement. It is an essentially hydraulic cement, containing considerably less lime than Portland cement, and a correspondingly increased quantity of silica and alumina, and it is burned at a much lower temperature It is produced by the simple calcination of an argilaceous limestone, which is found in many parts along the English coast. The principal seat of the industry was in the Isle of Sheppey, where large quantities of the stone were found; but it has been entirely superseded by Portland cement, and very little is now made. It is of a dark brown color, and sets very quickly whether left in air or put in water. It attains its maximum strength in a very short time, and when tested for tensile strength in the same way as Portland cement, breaks at about 200 lbs. per square inch when seven days old, and it never increases much more. Medina, lias, and other cements are simply variations of it.

"Plaster of Paris is calcined alabaster or gypsum, and is sulphate of lime containing about one-third part of water. The object of calcination is, therefore, only to expel the combined moisture. The calcination is carried out at a very low temperature, and it is then ground to the desired fineness. In some districts the gypsum is first ground to powder and the moisture evaporated from it by placing it on hot plates. Plaster of Paris sets very quickly when water is added to it. It is of value only for internal work, as it never attains very great strength or hardness. For working cornices, etc., in rooms, it is often mixed with lime-putty to make it slower setting.

"Keene's, Martin's, and parian cement are all manufactured from plaster of Paris by the addition thereto of alum, sulphate of potash, or borax. By these additions in the proper proportions the plaster is rendered extremely hard on the surface, and is capable of taking a certain amount of polish. Many of the artificial marbles are made with one or another of them as a base, with coloring matter added to give the vein of the stone or marble it is intended to imitate."

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

A "Note" from Mr. Henry Aitken.—Mr. Henry Aitken, of Falkirk, Scotland, who enjoys a justly-merited reputation for straightforwardness and application as a gas engineer among the fraternity on both sides of the Atlantic, has conveyed to us the following interesting communication. It bears date of January 5th:

"To the Editor American Gas Light Journal:—In your Journal, in issue of Dec. 16th, page 311, you furnish report of a paper, read before the American Gas Light Association, by Mr. S. G. Stiness, on the subject of 'A Positive Cure for Choked Stand-pipes.' Since I have had some experience in this matter, and as I have devised a plan which keeps the hydraulic main free from all deposit of tar or pitch, I beg you would be kind enough to allow me to place the following remarks before your readers.

"Mr. Stiness' contention is that if the hydraulic main is kept free from pitch or heavy tar, there will be no choked stand-pipes; and his pleasant experience of a few months no doubt gives him confidence in saying that his idea is correct. Whether or not Mr. Stiness is correct in this contention is not the point upon which I would now desire to enter. What I wish is to describe a simple means for keeping the hydraulic main clear, and at the same time furnish a gas with an increased illuminating power of from 10 to 25 per cent., the extent of the increase depending on the nature of the gas making material employed.

"Early in 1883 I mailed each of your subscribers a copy of my patent taken out in Great Britain in 1874, and issued in the United States either in that year or early in 1875. This patent shows that one way of working the process therein described is effected by placing the condensers above the hydraulic main, so as to enable the tars to flow back into it. The hydraulic main being covered so as to keep it hot—say, at a temperature of 160° to 170° F.—these hot tars flowing through it will dissolve the hard tars or pitch, and thus the whole would flow out together.

"There is the further advantage to be gained from this manner of working, viz: Any of the light oils or spirits condensed and absorbed by the tars in the process of condensation are heated up in the hydraulic main, converted into vapor, and caaried off by the gas, thus greatly adding to the illuminating power; and it is also to be borne in mind that when gases are so treated there is not the slightest trouble with naphthalene. Not only so, but experience has taught us that such gases have the power of absorbing naphthalene that had formed and been deposited in the pipes when gas was being passed through them which had been treated under the old-fashioned or previously employed methods of condensation.

"No doubt it is not always convenient to place the condensers above the level of the hydraulic main, and I am fully aware that in nearly all gas plants as now constructed the condensers are not so placed; still the circum-

stance is not a grave objection, as it is an easy matter to pump the tars from condensers into hydraulic main, heating them up to, say, 170° F. on their passage. For this purpose only a small pump and a steam heater are required, or even a steam-jet might be used—though the pump is decidedly to be preferred—or a steam pipe might be laid on bottom of hydraulic main. Such a pump and heater would cost here only about $100—a small sum when one considers all the advantages which I claim result from my manner of working."

PROBABLY GAS IS GOOD AND CHEAP AT TIFFIN.—Brother Joseph Bate, Supt. and Sec'y of the Tiffin (Ohio) Gas Light Company, as also Secretary of the Ohio Gas Light Association, propounds to us the following conundrum: "Edison is flourishing here in the shape of an accumulating indebtedness. Why is this, when he came here to close us up?" The reason for the "sad accumulation" may very likely be found in the heading of this item, and it certainly would be a sufficient one. The real truth of the matter is, though, Mr. Edison has never been very successful in his attempts at "closing anybody up," unless exception be made in the case of "closing up" and "out" the bank balances of some of the speculators who "got in on the ground floor" of that wonderful "parent company" of his not such a long time ago. By-the-way, the President of the Tiffin Gas Company is the Hon. Geo. E. Seney. Mr. Seney has represented his district in the House of Representatives for the term ending with this session, and so well did he acquit himself that he was, at the election held last November, chosen as his own successor. There are some *trusted* gas men after all.

PRICE OF GAS REDUCED AT SPRINGFIELD, OHIO.—At the regular annual meeting of the Board of Directors of the Springfield (Ohio) Gas Light Company, held on Tuesday, Jan. 13th, it was unanimously agreed upon to reduce the selling price of gas from ruling rate of $2 to the figure of $1.75 per thousand cubic feet. The reduction was also made to include all gas consumed in the public buildings, although the Company has a contract with the municipal authorities at the $2 price which does not expire until September, 1885. The new rate was made without solicitation on the part of the consumers; indeed, this is the most gratifying feature connected with the generally widespread movement now taking place with regard to the lowering of selling rates. The gentlemen concerned in the management of the Springfield Company are to be congratulated upon their liberal policy.

CONTRACTS SECURED.—Mr. Adam Weber, proprietor of the Manhattan Fire Clay Goods Works, of New York city, has entered into a contract with the authorities in charge of the United States Military Academy, located at West Point, this State, for the erection of two benches of "sixes" and one of "threes," to be put up in accordance with his latest and most improved plan. The same gentleman is under contract to erect fifteen benches of "sixes" to the order of the Buffalo (N. Y.) Gas Light Company.

PERSONAL.—The many friends of Mr. Charles F. Smith will be glad to learn that, after several years of residence in Havana, Cuba, where he was engaged as engineer to the new gas company in the metropolis of the West Indies, he has resigned that position and returned to the United States, and is now at his home in Fitchburg, Mass. Mr. Smith achieved an excellent reputation as Superintendent of the Woonsocket (R. I.) Gas Company, which model works were designed and erected during his term of stay at that place. Although among the younger members of the fraternity, he has already had a wide, varied and rather remarkable experience. It was during his administration in Havana that the terrific explosion of the government powder magazine occurred, demolishing all the holders at the new company's works, except one small vessel of a capacity of 40,000 cubic feet. Notwithstanding the extent and completeness of the disaster, which would have unnerved many an older manager, by the most ingenious and extraordinary expedients he kept up the supply of gas, and not a single consumer was seriously inconvenienced. During Mr. Smith's stay in the "ever-faithful Isle" he was twice stricken with yellow fever, and he experienced many another vicissitude incident to a life in the tropics. He is a deservedly popular member of the fraternity, and a thorough believer in the orthodoxy of what the canvassers for the sale of water gas patents style the old-fogy method of gas manufacture. Mr. Smith is disposed to the view that old fogies are inclined to deal honestly with their fellow men.

KILLED WHILE EXPERIMENTING.—A despatch from Denver (Col.), dated Jan. 18th, brought the news that Dr. G. E. Smith, a retired physician of that city, was killed by an explosion of hydrogen gas. Deceased was engaged in the making of an experiment.

G. G. RAMSDELL TO DIRECT AFFAIRS.—That irrepressible "gas man," bright, active and popular, Geo. G. Ramsdell, of Vincennes, Ind., will not "down." At the semi-annual meeting of the Vincennes Board of Trade, held on Tuesday, Jan. 13th, he was chosen President of the body. Keep on, George; and, bearing in mind certain things that transpire at elections, who knows where you will land? A friend at our elbow suggests that Ramsdell always lands on his feet.

NATURAL GAS EXPLOSIONS.—Almost every day we are treated to an account of a natural gas explosion that occurred in some portion of the natural gas territory. One of the most remarkable occurrences of that nature is said to have happened at a point about eight miles from Pittsburg, Pa., on Jan. 22. A gang of laborers were engaged in repairing a leak in a natural gas conduit, and the explosion was caused by one of the hands who, while right over the spot where the escape was located, struck a match to *light his pipe!* The investigating match of the plumber may now hide itself.

EVANSVILLE GAS AND ELECTRIC LIGHT COMPANY.—The annual meeting of stockholders in the Evansville (Ind.) Gas and Electric Light Company was held on date of Monday, Jan. 19th. The stockholders expressed themselves as thoroughly well pleased with the state of affairs made apparent through a reading of the working reports for the year. The combined effects of prompt and polite attention to all complaints, with a general decrease in amount of gas bills, could but result in a decided increase in the total number of gas consumers, and universal satisfaction with the management of the company. A dividend of six per cent. was declared on the capital stock. After the various reports had been read and disposed of an election for directors for ensuing year was entered into. The following gentlemen were chosen: Francis J. Reitz, R. K. Dunkerson, Samuel Bayard, Wm. Heilman, Thos. E. Garvin, and Jacob Eichel. The Directors then organized the Board by the election of Mr. F. J. Reitz as President; R. K. Dunkerson, Vice-President; Samuel Bayard, Treasurer; J. B. Hall, Jr., Secretary. Mr. I. C. Baxter was re-appointed Superintendent of the gas (Mr. G. M. Hoag being appointed Superintendent of the electric) department of the works.

ELECTION OF DIRECTORS, BROOKLYN (N. Y.) GAS LIGHT COMPANY.—The following gentlemen were chosen to compose the Directorate of the Brooklyn Gas Light Company for 1885, at the annual election of that corporation, held on Monday, Jan. 12th: Messrs. C. E. Bill, Jas. How, P. C. Cornell, S. L. Husted, H. D. Polhemus, H. K. Sheldon, A. M. White, J. H. Armington, and H. H. Rogers.

ANNUAL MEETING PARIS (ILLS.) GAS LIGHT COMPANY.—The annual meeting of the directors of the Paris (Ills.) Gas Light Company was held on Tuesday, Jan. 6th. The selection of officers for year resulted in the choice of Mr. C. W. Powell, as President and Treasurer; R. N. Parrish, as Vice-President; and W. H. Levings as Secretary; the latter named gentleman was also appointed Superintendent. In common with all sections of the United States, Paris (Ills.) shared in the general business depression ruling in 1884; but the gas company there reports its account books as showing a most satisfactory state of affairs. The officers of the corporation rightly attribute the circumstance to the fact that during the year a reduction in selling rates of 40 cents per 1,000 cubic feet was made. The annual price of each lamp post in street lighting service was also reduced in the sum of $5. Gas is furnished to ordinary consumers at the rate of $2.40 per 1,000.

MR. EDISON MAKES ANOTHER PREDICTION.—The daily papers of this city claim that Mr. Thos. A. Edison recently asserted, while in conversation with Mr. Erastus Wiman, that the experiments preliminary to running the elevated railroads by electricity were advancing favorably. He said he should not be surprised to see steam engines dispensed with on those roads within a period of two years, or even earlier. I suppose we need not remind Mr. Edison that *some* gas is yet being made in New York city; and he probably has not forgotten that he indulged in some surmises anent metropolitan gas manufacture at not such a remote date either.

REDUCING PRICE OF GAS AT RICHMOND, VA.—At the regular monthly meeting of the Richmond (Va.) Board of Aldermen, held Monday evening, Jan. 12th, the resolution previously passed by the City Council, which ordered the making of a reduction in selling rates for gas, was taken up and discussed. Messrs. Burwell and Glasgow urged immediate concurrence in action taken by Council. When the question was put not a single vote was recorded as against the proposition. The new selling rates are $1.50 to ordinary consumers, and $1 to the city. The new schedule went into effect on consumption registered from Feb. 1st. Ex-Councilman Higgins and his fellow agitators of a year ago ought really to be credited with this result, since it was their well-directed efforts that placed the Richmond City gas works in shape to make this reduction possible.

NO ELECTRIC LIGHTS FOR ROMAN CHURCHES.—The following is a portion of an interesting article which appeared in the New York *Sun* of recent date: "Rome, Dec. 12, 1884.—On the 11th day of December, 384, the Roman Church was in great mourning, for Damasus, the great friend of Hieronymus,

was dead. Yesterday, fifteen centuries afterward, the whole city of Rome celebrated the memory of the great Pope in his own Basilica of St. Lorenzo, in Damaso, and the Roman people flocked to the church as in times of yore they flocked to the Coliseum or the Circus Maximus. The Basilica of St. Lorenzo in Damaso is well known to the tourist, as that church is embodied in the right wing of the great palace of the Roman chancery. The palace is the seat of almost all the Roman congregations, the residence of the grand Penetenciary, Cardinal Monaco, and of the Vice-Chancellor, Cardinal Mertel. In the times of Pius IX. it was the seat of the Roman Parliament, and Pellegrius Rossi was stabbed at the first steps of its main stairway. The celebration of St. Damasus has been quite an event for Rome. The three aisles of the basilica were literally covered with lights and flowers. Nearly 200 chandeliers and 2,000 tapers burned in the temple, and from the cupola a stream of electric light illuminated the tiara and the keys, which pontifical emblems were towering over the great baldachin under which lies the body of the saint. A crowd of little gilded angels supported, at regular intervals all along the aisles, rich festoons of flowers. From the seven niches of the side aisles hung alternately chandeliers and baskets of flowers. The decoration was so tasteful and so rich that many criticised it as being too profane, and even intimated that the presence of the electric light in the church, together with so many flowers and cheerful ornaments, suggested one of the most lively scenes of 'Excelsior,' which was being performed at the Costanzi Theater. These criticisms were so persistent and universal that the authorities were obliged to prohibit the electric light, which was used after the first evening only as a means of illumination in the courtyard of the Cancelleria, where the carriages of the Cardinals and of the Roman princes were stationed during the religious services. * * * These solemnities have created a bad feeling on account of the electric light episode. When the solemnity was over (Dec. 12), a notice was given to all the clerical papers of Rome warning all the rectors of churches, both in Rome and abroad, against the use of baskets of flowers hanging from the ceiling, and against magnesium, calcium, and electric lights."

Public Lighting of Boston, Mass.—We extract the following particulars from the annual report of the Superintendent of Lamps of the city of Boston (Mr. John T. Manson), for the year 1884:

Comparison of prices paid for gas consumed in public lamps from 1877 to Dec. 31, 1884—

	1877.	1878.	1879.	1880-3	1884.
City proper	$2.00	$1.90	$1.75	$1.50	$1.30
South Boston	2.40	2.25	2.25	2.00	1.85
East Boston	2.40	2.25	2.25	2.00	1.85
Roxbury	2.40	2.25	2.25	1.87½	1.65
Dorchester	2.90	2.75	2.75	2.25	2.00
Brookline and Brighton	2.90	2.75	2.50	2.25	2.00
Jamaica Plain	2.90	2.75	2.75	2.25	2.00
Charlestown	2.40	2.25	2.25	1.87½	1.75

The following schedule shows the prices charged by the different companies for gas supplied to public buildings and private consumers:

	Public Buildings.	Private Consumers.
Boston Gas Light Company	$1.50	$1.50
Roxbury " "	2.00 (5 p.c. off)	2.00
Dorchester Gas Light Company	2.50*	2.50*
Charlestown " "	2.00	2.30
South Boston " "	2.00†	2.00†
East Boston " "	2.00	2.00
Jamaica Plain " "	2.37½	2.50
Brookline " "	2.25	2.50

The large 3-cluster burner Bray lanterns which were experimentally tried some time ago have given such general satisfaction that the Lamp Committee ordered the erection of several more, which were placed at prominent points throughout the city and in the suburbs. These high power Bray burners and lanterns are all rated to a consumption of 30 cubic feet per hour, and are distributed as follows: In Boston proper, 24; Roxbury, 4; South Boston, 1; Charlestown, 4. In addition to the 30-feet Bray lanterns the Charlestown Company maintains three improved high power lanterns—two of them rated to consume 100 cubic feet per hour, the other consuming 75 feet per hour. These lights burn all night and every night in year, and the city pays for same 65 cents each per night. Since the rebuilding of Warren bridge the Committee decided to light it with lanterns carrying 9 feet per hour burners. At $1.30 per 1,000, Mr. Manson places the annual cost of their maintenance at $51.17 each—of which sum $44.79 is for gas, and $6.38 is the charge for lighting and care. During the year the Committee decided to place 5-feet per hour burners in lanterns situated on wide thoroughfares (4-feet per hour is the prevailing rule in Boston); this was done to a total of 261 lamps. Mr. Manson places the cost of each (gas same as before) at $31.26—of which sum $24.38 represents gas, and $6.38 lighting and care.

* If paid within 15 days, $2. † If paid within 10 days, $1.80.

Public electric street lighting was first introduced into Boston on date of Feb. 15th, 1882, beginning with five "arcs," located along Scollay square. On Jan. 1, 1883, there were 114 of these lights; 381 on Jan. 1, 1884; and 401 on Jan. 1st, 1885. Of these lights 218 are assigned to Brush Company; 141 to New England Weston Company; 26 to Merchant's Company, and 16 to Union Company. The electric companies charge a uniform price of 65 cents per lamp per night. In the contracts made the several companies agree to indemnify the city against "any and all claims for damages for injuries to persons or property arising from imperfect insulation of wires, or construction or maintenance, or use of its wires or apparatus, etc." Within the limits of corporate authority, of city of Boston, on date of December 31, 1884, there were operated 12,809 public lights. Of these 9,817 were gas lamps; 2,591 were oil lamps; and 401 were arc lights. The comparative total cost of each description for years 1883–4 is as annexed:

	1883.	1884.
Gas lamps	$271,777.89	$255,463.30
Oil lamps	6,479.36	5,565.93
Electric lights	58,855.18	90,785.80
Gross	$337,112.43	$351,815.03

The ordinary gas lighted lamps in city are kept burning on a schedule that foots up to an annual total of 3,828 hours each.

The Difference between the Two Sorts of Gases.—A man accompanied by a female entered the small hotel at No. 123 Canal street, New York city (known as the New Transit House), at 6 A.M., on morning of Jan. 23d, registering as "Mr. Neuman and wife." They were assigned to a room and retired. Some hours after their arrival the odor of escaping gas was noticed; search after the leak showed its source to be located in the room occupied by the persons above mentioned. The proprietor of the hotel was notified, and by his orders the door of the apartment was broken open. The inmates were found dead in bed. The burner was turned fully on, and was without a safety pinion. The inference is plain—a case of "turning off and on." Neuman was subsequently identified to have been a man named Bendett, an assistant or clerk at a grocery store located in No. 6 Ludlow street. His female companion was not identified. This was a case of water gas; now note the difference. On the date of Thursday evening, Jan. 22d, a woman, first name Sarah, employed as a domestic in a family occupying residence at No. 434 East 84th street, this city, blew out the gas preparatory to going to bed. Ten hours afterward discovery of her condition was made. She was removed to the Presbyterian Hospital, where recovery ensued. No need to say what sort of gas she inhaled.

Here is another Specimen.—A woman named Rose Schesslinger retired to bed in her apartments, No. 1,031 Market street, San Francisco, Cal., at 10 P.M., on night of Jan. 3d. She was left undisturbed until 4:30 P.M. of following day. Investigation proved that she had blown out the gas either knowingly or unwittingly. The woman recovered; and it was coal illuminating gas that was supplied to the premises.

Correspondence

[The Journal is not responsible for the opinions expressed by correspondents.]

Utilization of Waste Heat of Gas Works.

Office St. Croix Gas Light Co.,
Calais, Maine, Jan. 16, 1885.

To the Editor American Gas Light Journal:

Permit me to make the acknowledgment that the Journal has been a great source of profit to me during several years, and more particularly so since, owing to circumstance and situation, I have been unable to attend the Association meetings.

With your permission I would like herewith to present a brief "note," giving my experience with regard to heating steam boilers in gas works from the waste heat of the benches, in the hope that it may possibly prove of interest to some of your readers. Starting in with the deliberate opinion that any gas company, possessing a proper chimney and connections as a part of its plant, need not be at the expense of one dollar in connection with extra fuel used in generating steam, I will explain the method that has been in perfectly satisfactory use in our works for some time.

Our plan is to tap the flues near the ground line—care being exercised not to baffle the heat through allowing it to descend after it leaves the bench—this being done to avoid placing the boiler on top of the stack. The boiler is placed and set up on the floor at side of bench, in the usual way. We introduce the flue at back end of boiler, and pass the heat through the tubes only. The quantity of heat required is controlled by a damper arrangement in boiler stack, and the excess or surplus heat is led into chimney by direct flue. If required, all the heat can be sent through the boiler, and so as not to injure the draught of bench if the details are carefully observed.

I shall hold myself pleased to furnish any of your readers with whatever other information they may require.

Very truly,
F. N. Davis, Supt. & Treas.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,

PROPRIETORS.

Editor—JOS. R. THOMAS, C.E

Manager—C. E. SANDERSON.

PUBLISHED ON THE 2ND AND 16TH OF EACH MONTH

At No. 42 Pine Street, New York.

TERMS

SUBSCRIPTION—Three Dollars per annum, in advance.

MONDAY, FEBRUARY 2, 1885.

The Market for Gas Securities.

The city gas share market is and has been dull and listless. At the time of writing (Jan. 29th) the list is in an unsettled state, and generally inclined to weakness. This weakness may in part be attributed to the fact that the Legislature is in session, and also because Mr. Sherwood, in company with quite a select few whose names are familiar to the New York public as those of folks particularly apt to air their eloquence with reference to reform whenever they have an opportunity of so doing, are at present indulging in a rather "windy" attack upon the Consolidated Company of this city. A meeting was held at Delmonico's uptown house on evening of Jan. 27th, and the amount of "blowing" indulged in was simply immense. The "professional" reformers in attendance included the rather familiar names of Jackson H. Schultz, F. B. Thurber, A. S. Sullivan, and many others. Mr. N. R. O'Connor was also present; and of course pure and simple benevolence for the "suffering consumer" induced his attendance at the meeting. The gas meter attracted great attention as usual; and Mr. Sherwood, in the bitterness of his feelings, claimed that "when he had gone to the gas companies for redress for grievances he had been treated like a dog." He certainly "barked" loudly at the Delmonico session. An amateur journalist named Bottsford inflicted the "reformers" with an address that beat anything "Prof." Lowe ever delivered himself of. One year ago Bottsford could not make the distinction between a gasholder and a condenser. He has been "reading up" since, and now knows it all.

The trouble with the "gas reformers" is that they dont know what they are talking about. Assemblyman Coffey has introduced the "annual joker" in the shape of a resolution offered by him to forbid gas companies throughout the State from charging a higher rate than $2 per 1,000 cubic feet. The resolution is supposed to be aimed more particularly at the Citizens' Company, of Brooklyn, N. Y., as Mr. Coffey resides in its district.

New York Gas Light Company paid a dividend of 1 per cent. on Feb. 2; New York Municipal has paid one of 20 per cent.; and the Manhattan one of 10 per cent. on Feb. 2.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks (with A. E. SCOTT & CO.,)

72 BROADWAY, NEW YORK CITY.

FEB. 2.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Central	$440,000	50	60	—
" Scrip	220,000	—	47	57
Equitable	2,000,000	100	93	95
" Bonds	1,000,000	—	102½	103½
Harlem	2,000,000	50	110	113
" Bonds	170,000		—	—
Manhattan	4,000,000	50	240	250
Metropolitan	2,500,000	100	210	220
" Bonds	658,000	—	110	112
Mutual	3,500,000	100	120	122
" Bonds	1,500,000	1000	104	106
Municipal	3,000,000	100	190	200
" Bonds	750,000		107	110
New York	4,000,000	100	145	150
Northern	125,000	50	—	80
" Scrip	108,000			
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	127	130
Citizens	1,200,000	20	84	86
" S. F. Bonds	320,000	1000	106	110
Fulton Municipal	3,000,000	100	148	150
" Bonds	300,000		104	108
Peoples	1,000,000	10	77	80
" Bonds	290,000	—	105	110
" "	250,000	—	90	95
Metropolitan	1,000,000	100	96	—
Nassau	1,000,000	25	119	—
" Ctfs	700,000	1000	92	94
Williamsburgh	1,000,000	50	134	137
" Bonds	1,000,000	—	106	108
Richmond Co., S. I.	300,000	50	64	75
" Bonds	40,000	—	—	—
Out of Town Gas Companies.				
Buffalo Mutual, N. Y.	750,000	100	80	85
" Bonds	200,000	1000	95	100
Citizens, Newark	918,000	50	103	115
" " Bonds.	124,000	—	105	110
Chicago Gas Co., Ills	5,000,0000	25	125	—
Peoples G. L. & C. Co., Chicago, Ills			8	12
Cincinnati G. & C. Co.			180	182
Consolidated, Balt.	6,000,000		82½	83
" Bonds	3,600,000		110	111½
Central, S. F., Cal.			—	58
Capital, Sacramento, Cal.			55½	—
Hartford. Conn	750,000	25	122	128
Jersey City	750,000	20	124	128
Laclede, St. Louis, Mo.	1,600,000	100	88	—
Louisville, Ky	1,500,000	50	95	100
Montreal, Canada	2,000,000	100	181	182½
New Haven, Conn		25	166	170
Oakland, Cal			29	30
Peoples, Jersey City		—	—	75
" " Bonds			—	—
Paterson, N. J		25	96	99
Rochester, N. Y		50	75	80
Washington, D. C.	2,000,000	20	190	195
Wilmington, Del		50	188	—
Yonkers		50	90	92
St. Louis, Missouri	600,000	50	340	—
San Francisco Gas Co. San Francisco, Cal.			58¼	59

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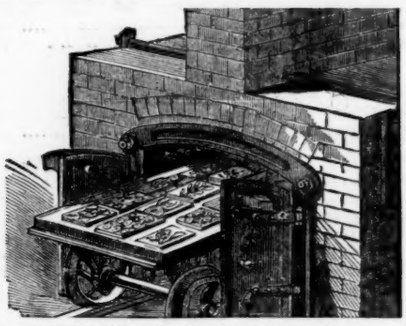

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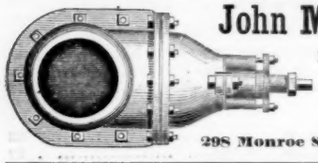

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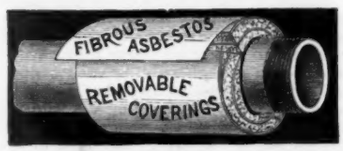

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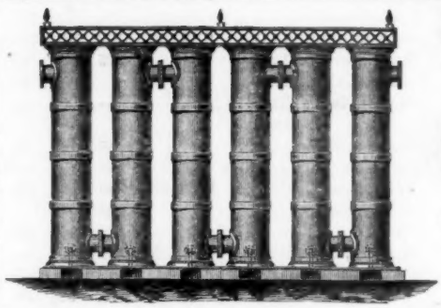

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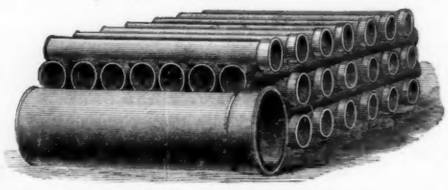

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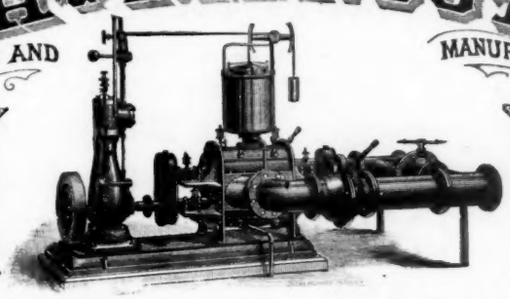

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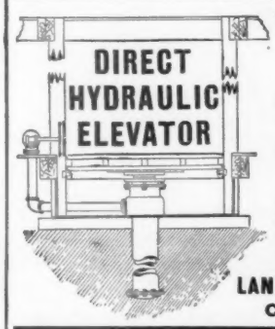

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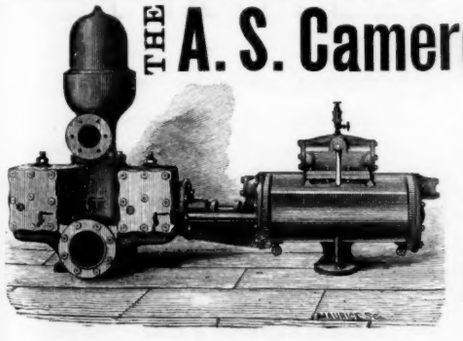

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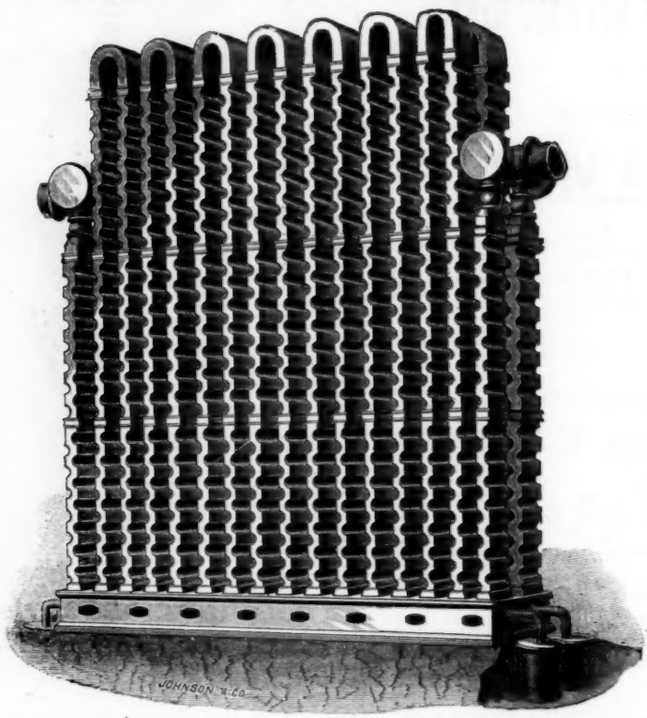

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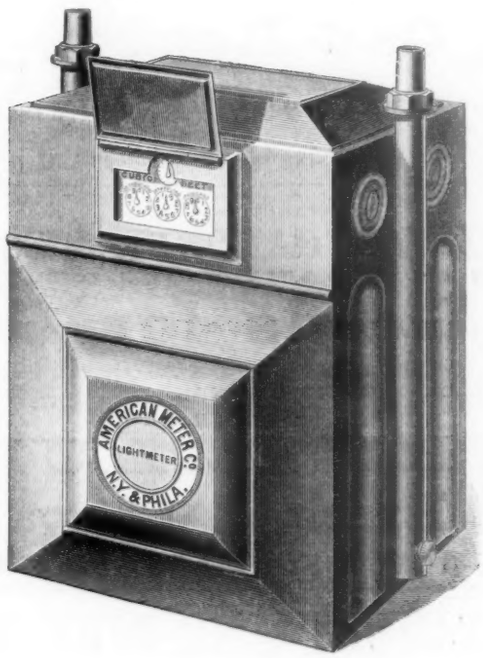

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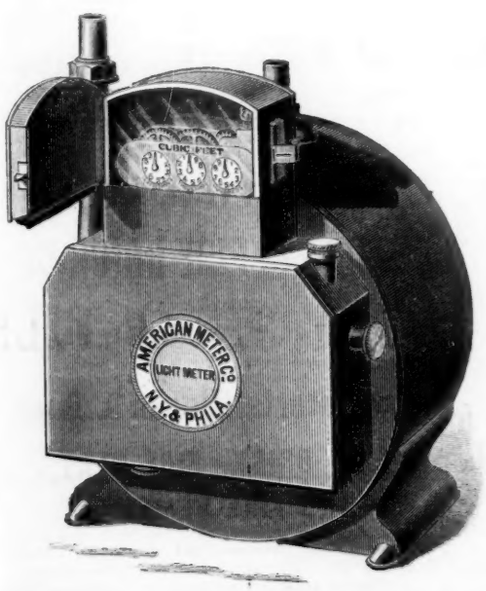

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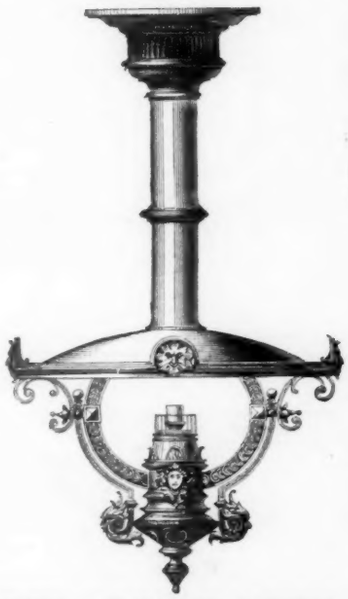

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1879	24,545,000	"
1880	42,967,500	"
1881	36,462,500	"
1882	39,300,000	"
1883	57,735,000	"
1884	26,177,500	"
Total	235,937,500	cubic feet.

Total Number and Capacity per 24 Hours of "Standard" Washers Erected and in Course of Erection in the Several Countries

	Number.	Cubic Feet per Day.
Great Britain	151	157,070,000
Western Hemisphere	38	39,337,500
Australia	18	12,150,000
New Zealand	2	650,000
France	6	4,550,000
Belgium	8	5,420,000
Germany	16	8,200,000
Holland	4	4,160,000
Denmark	1	150,000
Russia	2	3,500,000
Spain	1	350,000
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Total	248	235,937,500

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C. R. FABEN, Jr.,
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Bombay Gas Co	400,000
Brussels Co	1,250,000
Chemnitz Gas Co	1,000,000
CITIZENS GAS CO., BUFFALO	750,000
Coke Works in Zabre, Ober-Schlesien	1,500,000
Cokerei der Friedenshutte, Upper Silesia	200,000
Dumfries Corporation	250,000
Dunedin Gas Co., New Zealand	400,000
King's Lynn Gas Co	300,000
Leiden, Holland	600,000
Lincoln Gas Co	400,000
Liverpool Gas Co	2,000,000
" "	3,000,000
LOUISVILLE GAS CO.	1,500,000
Numea Gas Co	100,000
PITTSBURGH GAS CO	1,500,000
PORTLAND GAS CO., Oregon	562,500
SAN FRANCISCO GAS CO	4,000,000
Sheepbridge	40,000
ST. LOUIS GAS CO	2,000,000
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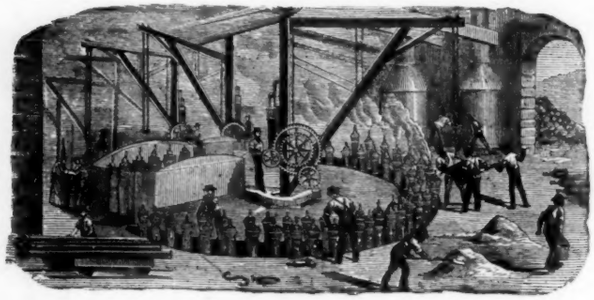

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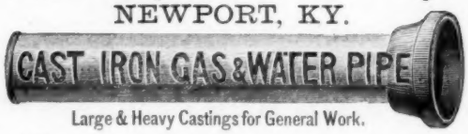

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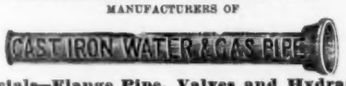

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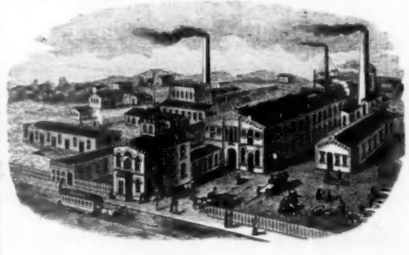

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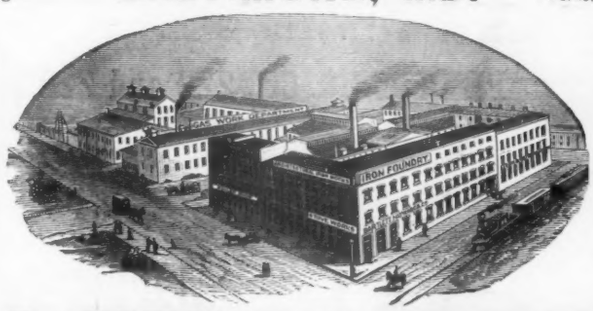

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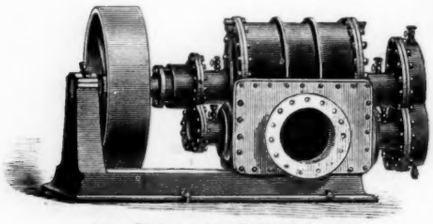

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